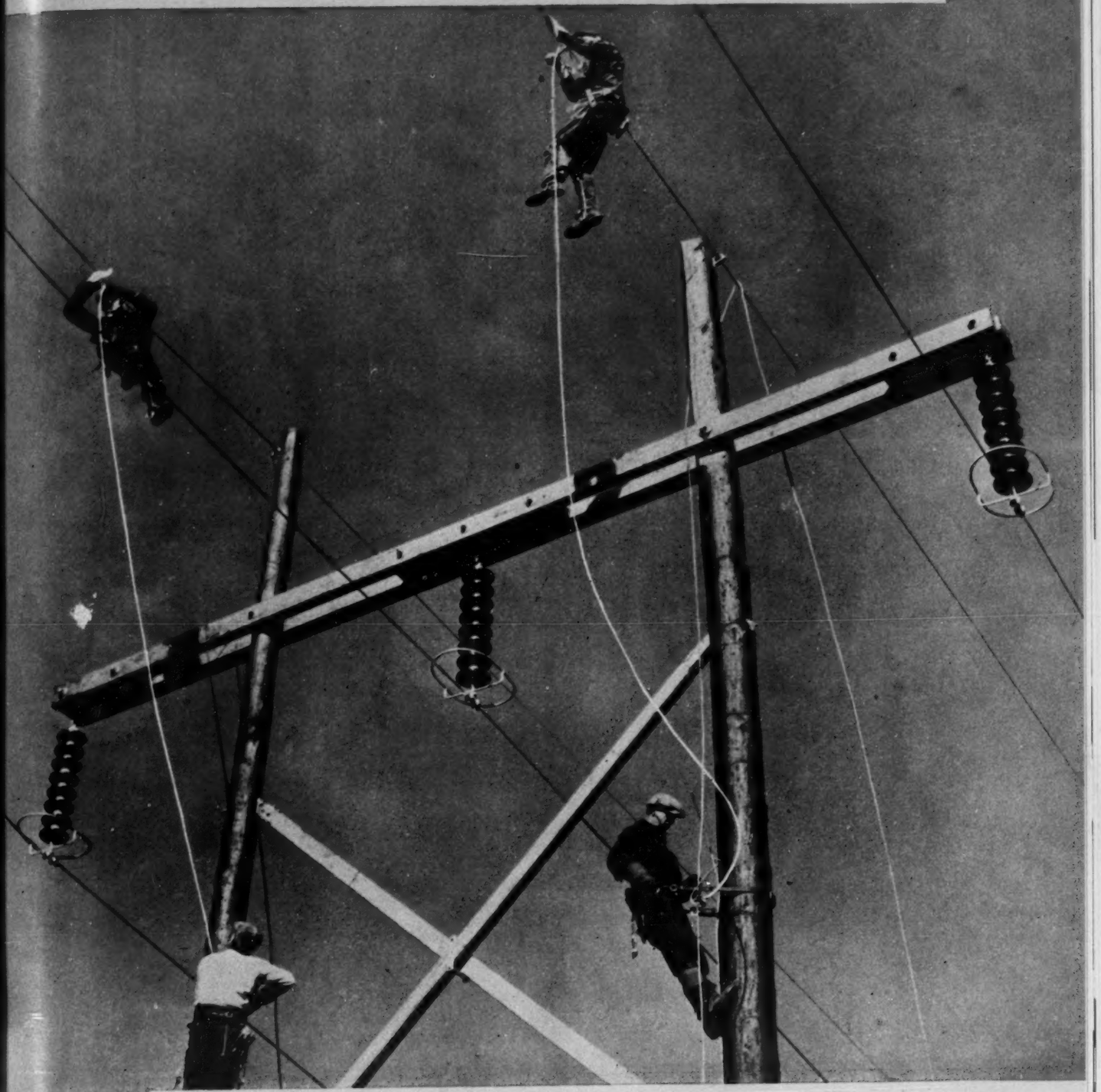
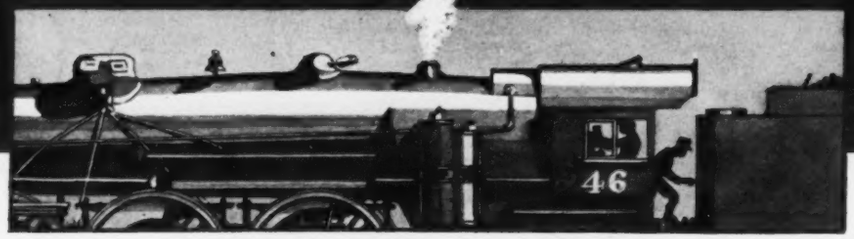
Electrical World

OCTOBER 30, 1943



CONNECTING FLYING TAPS TO OVERHEAD GROUND WIRES

SAFETY VALVES



OF A NATION!

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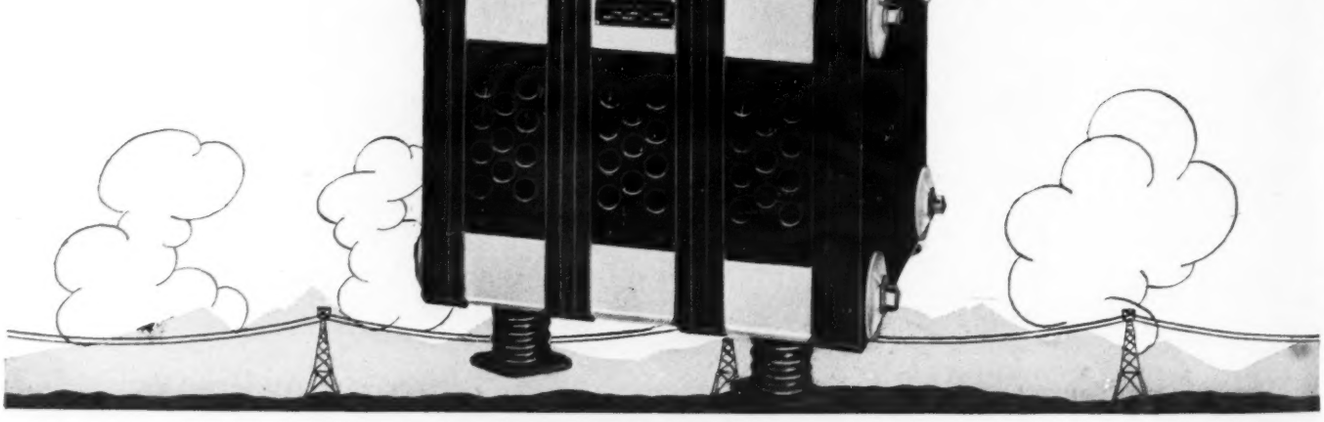
When destructive short circuits build ~~up terrific overloads,~~ your good Murray Reactors dissipate the excess long enough to give the circuit breakers their "second wind."

They are, indeed, the safety valves of America's stream of electric power. They save costly shutdowns. They keep industry *humming*. They keep the bright lights of progress *burning*. Every utility *needs full* Murray Current Limiting Reactor protection. Metropolitan Device Corporation, 1250 Atlantic Av., Brooklyn, N. Y.

MURRAY REACTORS



Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 69 YEARS

October 30, 1943 — Vol. 120, No. 18

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Please change my address on Electrical World

From .....

.....

To .....

.....

Signed .....

MISSING

...yet still in action

For years, Manson Tape has occupied the highest position of all friction tapes. Whenever the utmost safety and permanence in splice protection was required, Manson Tape became the first choice of experienced engineers and electricians. Purchasing agents, too, willingly paid more to get lasting protection.

Contributing to this fine reputation of Manson Tape was the pledge of The Okonite Company to use only the best materials in its manufacture. One of these materials was a special type of natural rubber, which thoroughly impregnated and coated the strong, closely-woven cotton fabric. The exclusive use of this special type of new rubber was one reason why Manson Tape was unequaled in true adhesiveness and in aging and weathering qualities.

Today, with *all* new rubber forbidden for this use, the manufacture of Manson Tape has been temporarily discontinued because, if made with the materials currently available, Manson Tape would not have the superior characteristics nor be of the same high quality that you have always known.

As an assurance to the thousands of electrical men who have so consistently used it, we remind them that older joints and terminals made with Manson Tape will stay protected for years to come. To those who are fortunate enough to have available a supply of Manson Tape, we suggest it be reserved for the most important jobs.

UNTIL MANSON TAPE IS AGAIN AVAILABLE

We recommend as an alternative, *Dundee "A" Friction Tape* which fully complies with all current Federal and A.S.T.M. emergency specifications.

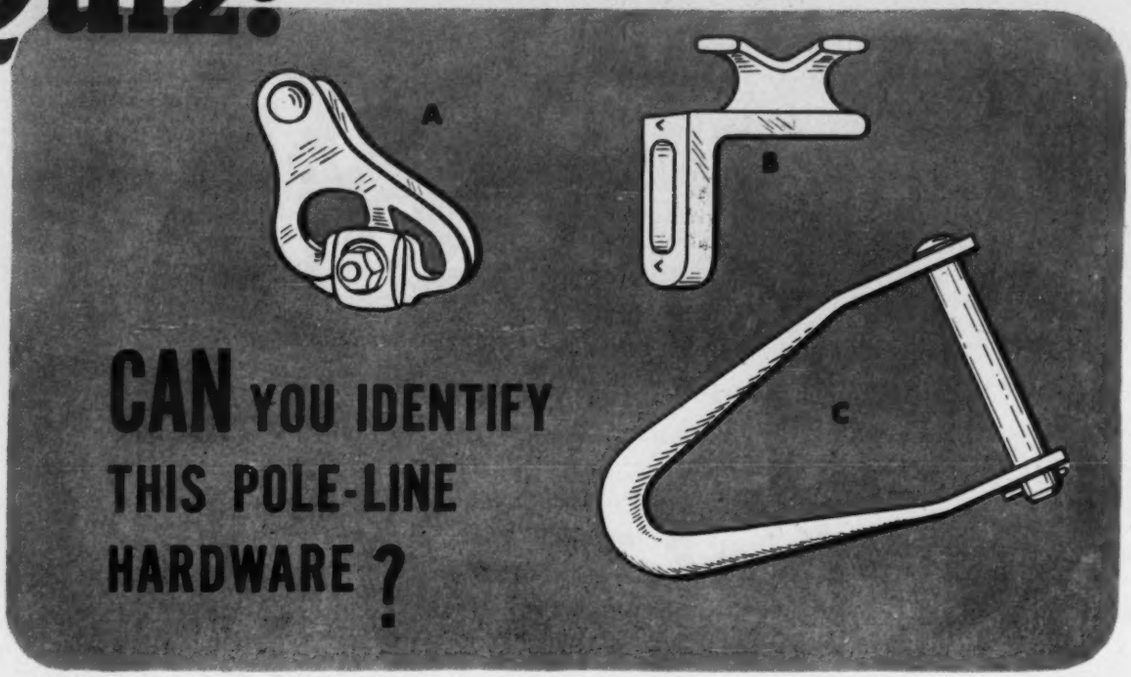
THE OKONITE COMPANY

PASSAIC OKONITE NEW JERSEY

3436

MANUFACTURERS OF INSULATED WIRES, CABLES AND TAPES SINCE 1878

Quiz:



For Help on Farm Electrification Lines Call Your GRAYBAR Representative

INCREASING interest in farm electrification work is resulting in new hardware items and new ways of using them. In this field, GRAYBAR is unusually well qualified to help you.

Among GRAYBAR'S suppliers are most of the leading builders of specialized products for rural-line work—hardware, insulators, wire, tools. In addition, you get the benefit of GRAYBAR'S *nationwide* experience in serving such jobs, in the South, the Northwest, and wherever pioneering in this type of service has been done.

In spite of wartime limitations on fast delivery from warehouse stocks, you'll find that GRAYBAR'S facilities are unequalled for making the most of what's available with the least delay. As a current source of supply, or a "materials advisor" for your planning, GRAYBAR is ready and well equipped to serve you.

Here are the ANSWERS (INVERT PAGE)

(a) Strain clamp for dead-ending rural and distribution line conductors . . . equally effective for copper, copperweld or steel wire.

(b) Neutral wire bracket with top-wire groove. The wire is tied in the top groove and take-off wires attached around the knob.

(c) Secondary swinging clevis of the one-piece type, designed for eye-bolt mounting. Uses standard insulator for low voltage lines.

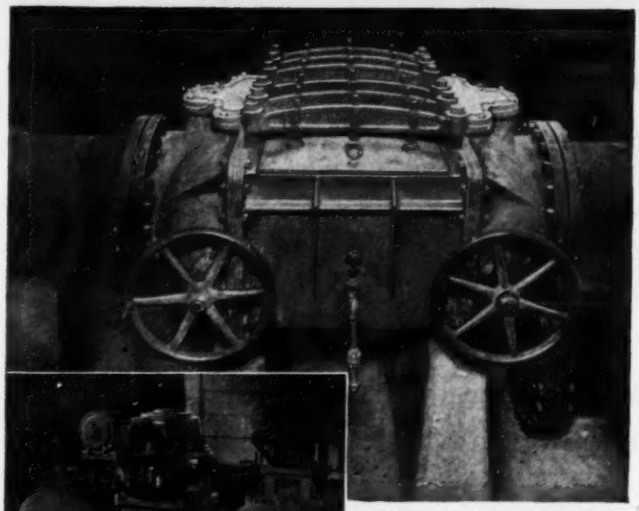
GraybaR

IN OVER 80 PRINCIPAL CITIES

EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK 17, N. Y.

ELLIOTT STRAINERS

Stop-light for trouble in water and oil lines



TWIN STRAINERS
This 20" twin strainer is one of 22 Elliott strainers in use in one central station. It protects a raw water suction line. Other Elliott twin and single strainers, in various sizes down to 2", serve in screen wash, chemical feed, lubricating oil, transformer oil, and fuel oil lines. One side of a twin strainer is cleaned while the other side is working.

SELF-CLEANING STRAINERS
do an excellent job of continuously cleaning service water in power plants. A geared motor slowly rotates a sealing box which covers sections of the straining element, allowing them to be back-flushed. Illustrated is a 24" size, part of an order of 16 for a war production plant. Built in sizes 4" to 24".

A star has been added to the Army-Navy "E" flags flown by both the Jeannette and the Ridgway plants of Elliott Company.

IN ALMOST ANY POWER STATION, Elliott twin strainers will be found tucked away in inconspicuous spots. No medieval fortress ever enjoyed more positive protection with moat, drawbridge and portcullis, than the water and oil handling equipment whose intake pipe lines are guarded by these unsleeping sentinels.

So many Elliott strainers of various types are in operation today, that we cannot even approximate the vast volume of water, oil and other liquids which they pass. Far less can we approximate the millions of dollars in damage, trouble and delay which they have prevented.

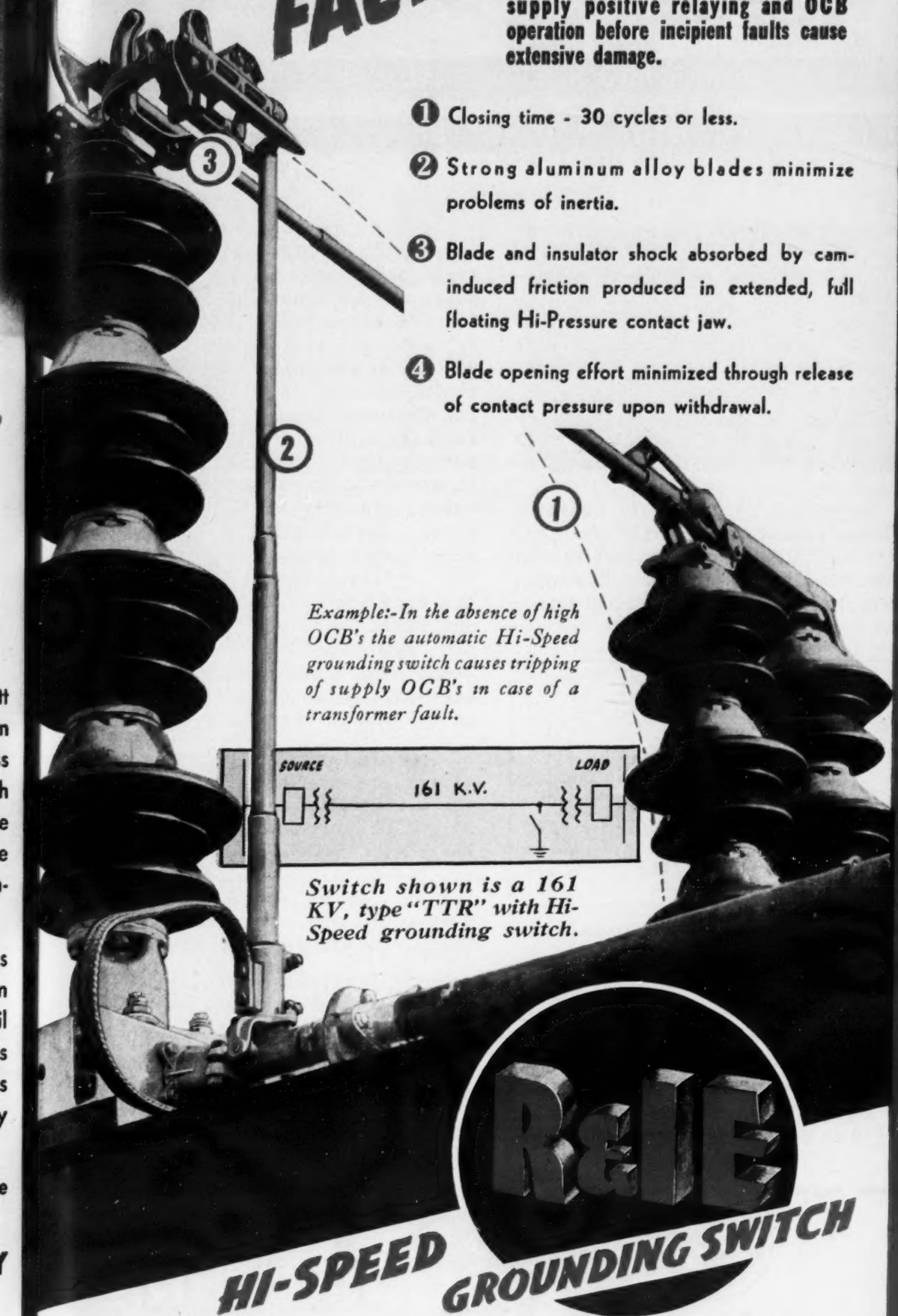
If you have a straining problem, use our wide experience in its solution. Write.

ELLIOTT COMPANY
Accessories Dept., **JEANNETTE, PA.**
DISTRICT OFFICES IN PRINCIPAL CITIES

HECK the FACTS

Protect transformers by using QUICK-ACTING grounding switches to supply positive relaying and OCB operation before incipient faults cause extensive damage.

1. Closing time - 30 cycles or less.
2. Strong aluminum alloy blades minimize problems of inertia.
3. Blade and insulator shock absorbed by cam-induced friction produced in extended, full floating Hi-Pressure contact jaw.
4. Blade opening effort minimized through release of contact pressure upon withdrawal.



Example:-In the absence of high OCB's the automatic Hi-Speed grounding switch causes tripping of supply OCB's in case of a transformer fault.

Switch shown is a 161 KV, type "TTR" with Hi-Speed grounding switch.

HI-SPEED R&IE GROUNDING SWITCH

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- ✔ DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- AIR BREAK SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

ILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

File....but

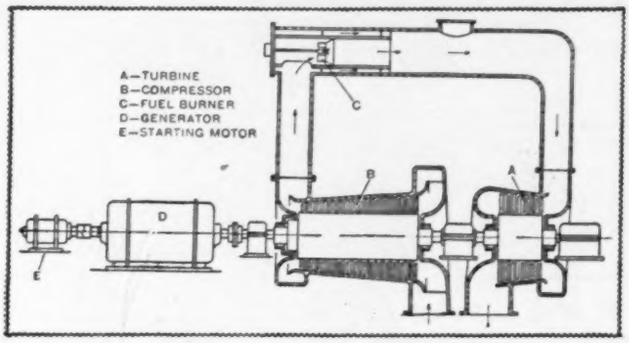
NEW IDEAS IN POWER AND ELECTRICAL EQUIPMENT ARE TAKIN

AVAILABLE UNDER HIGH PRIORITIES....ALL BELONG IN TH

☛ Power plant of the future probably will be built around gas turbines... operating at efficiencies equal to or better than diesels but with the low maintenance and simple lubrication of steam turbines. Building space per unit output will be lowest of any prime mover and no water will be required.

Present signs: already 19 Allis-Chalmers gas turbines and compressor units are employed in refining high-octane gasoline.

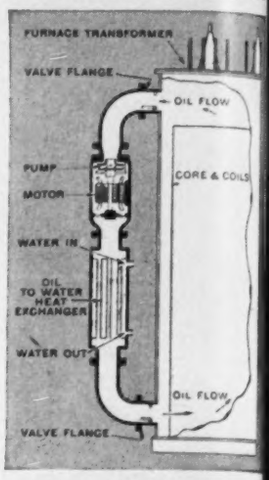
Operating sequence: 1) starting motor slowly rotates unit, building up air pressure, 2) fuel burner is ignited and hot gas enters turbine, 3) turbine takes load, drives compressor and generator, starting motor is disconnected.



OPERATING DIAGRAM OF MODERN COMBUSTION TURBINE

☛ Just moving oil faster in special transformer radiators — cools it enough so that designers need less copper and steel in transformer cores and coils. Allis-Chalmers "Electro-Cooler" does just that—but what's more it's done so simply that it makes forced oil cooling practical. That's the magic word—PRACTICAL!

So now that water-cooling coils are banned by WPB—and electric furnace transformers must be built without them—the "Electro-Cooler" with an oil-to-water heat exchanger replaces them. Allis-Chalmers transformer engineers save copper tubing—give steel makers a substitute for the water-cooled furnace transformer.



OIL-TO-WATER "ELECTRO-COOLER"

Investigate the widening applications of the "Electro-Cooler"—a unit composed of a heat exchanger and a "pump-in-a-pipe." Motor and pump are both immersed and lubricated by cooling oil.

☛ In the heart of a mercury arc rectifier, power-carrying electrons await the moment when a flash of bluish lightning will carry them from the anode to the cathode. There's one anode in each tank of a 6-tank Allis-Chalmers "Excitron" rectifier. Every 360th of a second, in sequence, bluish arcs flash in these tanks. What is the wizardry that times these arcs?

Excitrons are built to "fire when ready"—a procedure made possible by continuous excitation!

At the precise moment that a-c voltage on the anode equals the internal resistance of the mercury vapor gap—the bluish arc "train" leaves for the cathode.

WE WORK FOR VICTORY WE PLAN FOR PEACE

ALLI

don't forget

SHAPE FAST AT ALLIS-CHALMERS TODAY. SOME ARE ALREADY BACK OF EVERY LONG-RANGE PLANNER'S HEAD. HERE ARE A FEW:

Six pilot arcs burning steadily do the trick—they're always ready to start the "trains" on the 360th of the second. Herein lies the simplicity and stability of the Allis-Chalmers "Excitron."

High priority wall surrounds "Excitron" today, prevents all but most essential uses.

But plan to use it postwar. Higher efficiency of "Excitron" suggests profitable replacement of thousands of motor generator sets and synchronous converters.

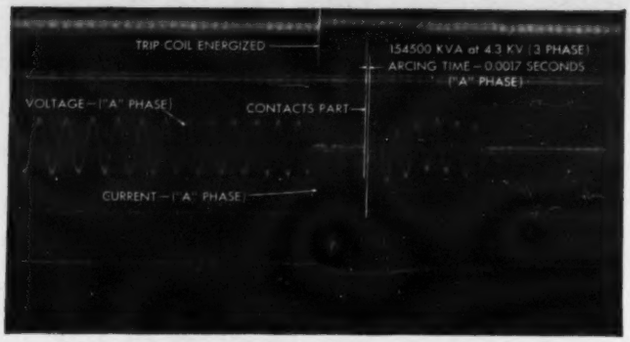
☛ Keep your eye on stronger trend toward air blast circuit breakers. Past year has seen Allis-Chalmers air-blast installations more than doubled.

Think of air-blast breakers in terms of protection and maintenance savings. Arcing times, less than 1/2 cycle throughout operating range, mean amazing contact life.

1,000,000 KVA AIR BLAST

Here's how it works in brief: small contact piston pulls back from orifice, high pressure dry air rushing into hole. Arc rushes through, too . . . stretches out and vanishes—at split-cycle speed.

Reliability? Air brake systems of heavy trains are no safer.



OSCILLOGRAM OF AIR BLAST INTERRUPTION

☛ Biggest graphite "pencils" in the world write the flaming story of armor in the electric arc furnaces of Uncle Sam. Formerly these pencil-like electrodes were misguided by erratic up and down movements—calculated to keep pace with the melting charge. But at 3000 deg. F—overtravel and under-travel just burned them up and caused inefficient melting.

With a new sensitive, wide-range control generator called the "Regulex" exciter — Allis-Chalmers engineers are keeping furnace arcs constant, enabling extra "heats" per day, conserving graphite electrodes. Steel men are happy now!

Basic fact is that amplifying characteristics of "Regulex" exciter parallel in many respects those of the electronic tube—with the important exception that it has d-c machine life and ruggedness.

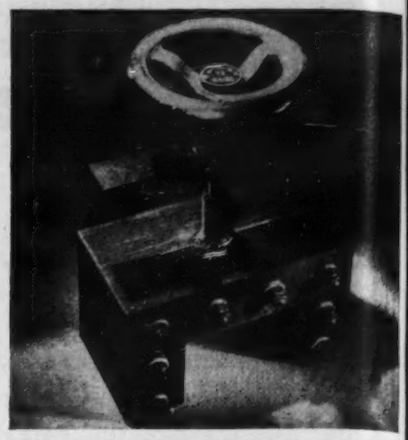
Look for other important new developments in electrical and power equipment from Allis-Chalmers. Maybe we can help you — maybe you can help us. ALLIS-CHALMERS, MILWAUKEE, WIS. A1612

CHALMERS

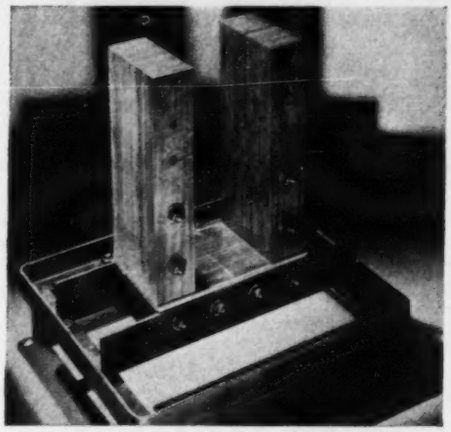
HERE'S THE NEW AMPAC '400' TO SAVE YOU MONEY!

1 It's an *a-c* welder — with no arc blow! Capacity is 50 to 500 amps — *the* ideal size. Note how simple, rugged the new Ampac is...

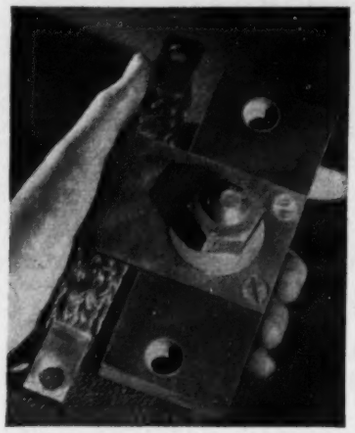
2 Here's power! Transformer coil has oversize rectangular winding—glass-insulated — with primary over secondary. Air duct prevents breakdown.



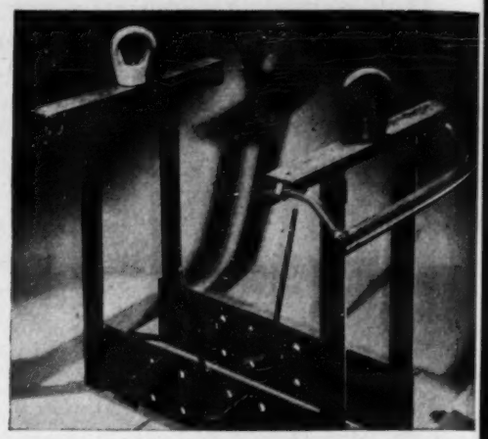
3 One inch movement of upper core — only 7 easy turns of wheel — covers entire welding range! Result: less wear, time saved!



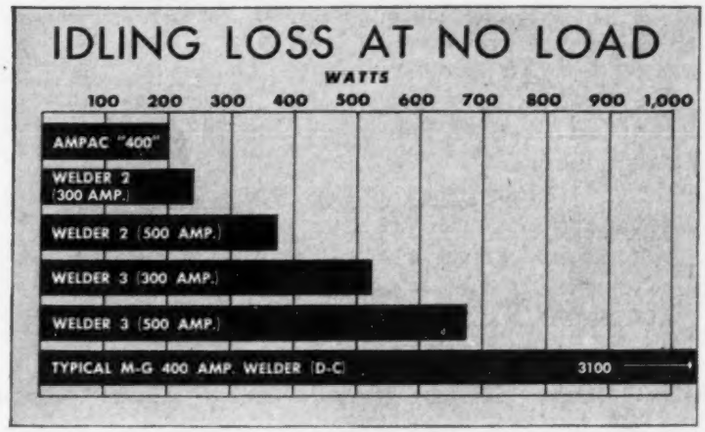
4 Lower core is 1-piece, U-shaped, die-punched silicon steel. Eliminates air gaps, cuts idling loss. Note 1-piece welded frame, heavy angles.



5 Extra heavy welding terminal will stand years of abuse. All permanent connections are *brazed!*



6 Sturdy lifting frame bolts to *core* for direct lifting of heavy mechanism. No load on case. Damage to case can *not* affect structure of electrical parts.


IDLING LOSS AT NO LOAD
WATTS
100 200 300 400 500 600 700 800 900 1,000
AMPAC "400"
WELDER 2 (300 AMP.)
WELDER 2 (500 AMP.)
WELDER 3 (300 AMP.)
WELDER 3 (500 AMP.)
TYPICAL M-G 400 AMP. WELDER (D-C)
3100

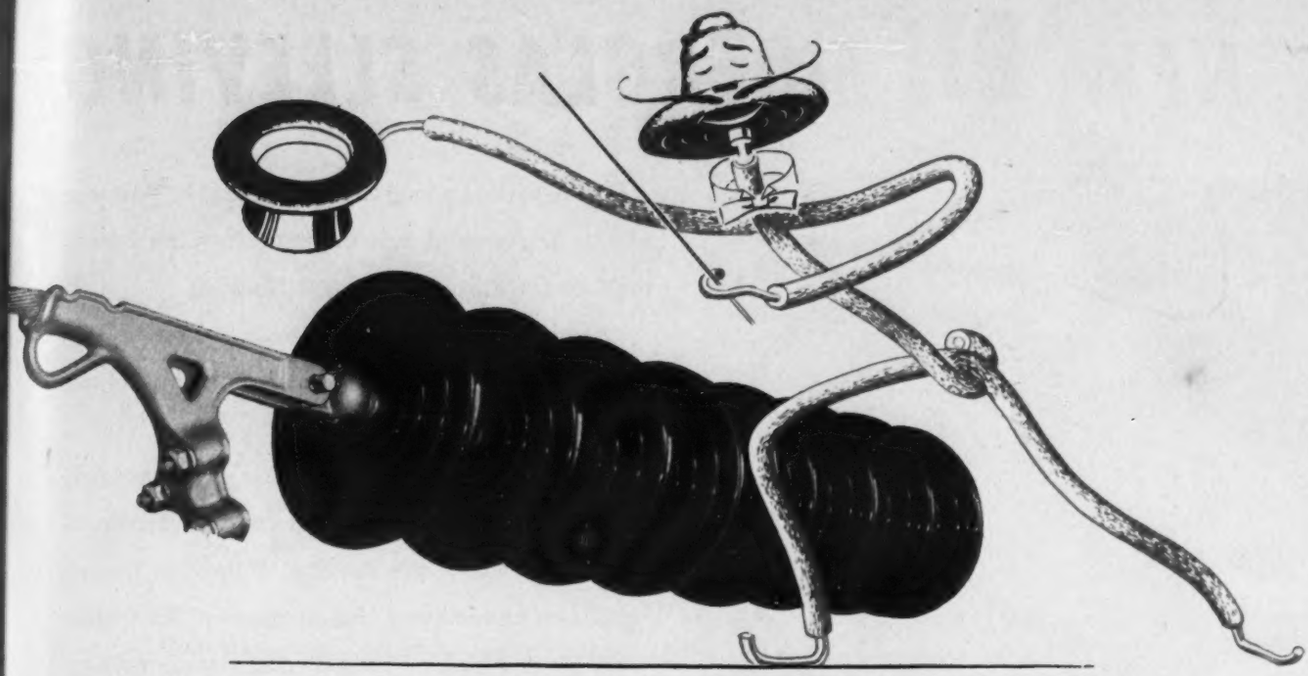
7 Compare Ampac with the 2 largest selling a-c welders and a typical d-c welder. At 2¢ per kw/hr, the d-c unit wastes $1.49 in a full day; Ampac's loss is less than 10¢! *And* — Ampac is more *efficient* than these welders!

A 1665

IT WILL pay you to get the full story on these brilliant new Ampacs. A new, patented circuit increases efficiency, cuts operating costs. Available in 200 amp units and up. Write for bulletins B6241, B6302.

ALLIS-CHALMERS

MILWAUKEE, WISCONSIN



IT'S NO TRICK TO MAKE A STRONG INSULATOR

Let's not over-emphasize the matter of brute strength in suspension insulators. It's no great accomplishment to build a strong insulator, or everybody wouldn't be doing it...The really important side of the strength story is the ability to build insulators to a definite strength standard, and then not miss that standard in any number of times...There was a time when strong insulators and those not so strong were averaged together to produce a strength rating that concealed the weakest units. This worked in all but a very few cases. These few, however, were potential trouble-makers simply because they deviated too far from a standard...O-B was the first to correct this. It took years of painstaking development to institute factory practices and inspection procedures which made it possible to brand all insulators with a minimum strength value--a rating below which no O-B unit will go...Look at any O-B suspension unit today and you will find permanently cast into the cap a strength figure which *really* means something because it is a guaranteed minimum, *not an average*...Use O-B insulators and get the kind of strength that counts, because you can count on it!

2405-H

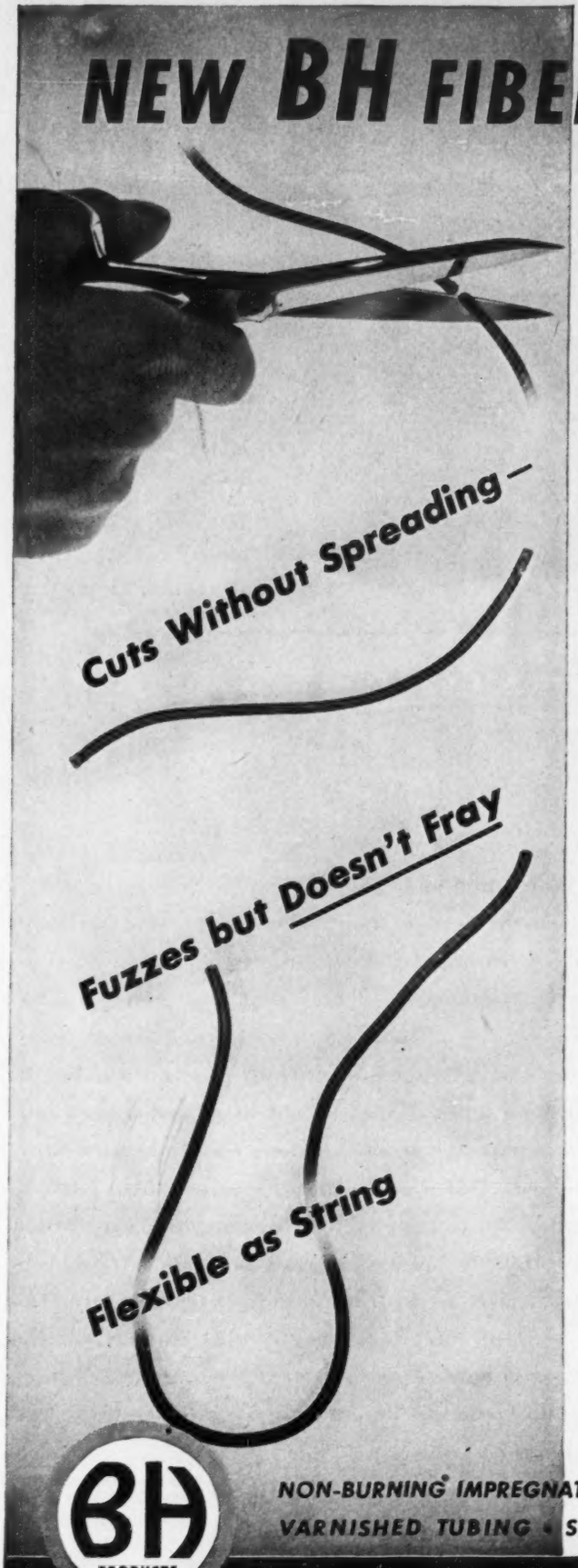
KEEP BUYING
WAR BONDS

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

NEW BH FIBERGLAS SLEEVING



You've waited a long time for a sleeving that was *both* flexible and non-fraying. Now it's here—BH Extra Flexible Fiberglas Sleeving.

As an example of the hundreds of uses for this new product, let's look at a typical brush shunt job. Sleeving for this application should be flexible. When cut to length, the ends should not fray or spread. Formerly, brush manufacturers stiffened the ends of the sleeving to prevent fraying and also to facilitate threading onto the pigtail. BH Extra Flexible Fiberglas cuts cleanly without spreading, eliminates the extra dipping operation. Furthermore, in service the ends do not fray. Constant vibration produces only the slightest fuzz. Yet even these are but a few advantages of this new sleeving.

NON-FRAYING • FLEXIBLE • HEAT-RESISTANT
NON-INFLAMMABLE • WATER-RESISTANT
NON-CRYSTALLIZING at LOW TEMPERATURES

The new BH Extra Flexible Fiberglas Sleeving is woven from the choicest continuous-filament Fiberglas yarns. It possesses high dielectric strength, is water-resistant and, like all BH Sleeving and Tubing—is non-inflammable.

All sizes, from No. 20 to 5/8", inclusive, are available. Write for samples of this radically new and different sleeving today—in the sizes you desire. Seeing is believing! Bentley, Harris Manufacturing Co., Dept. W, Conshohocken, Pa.

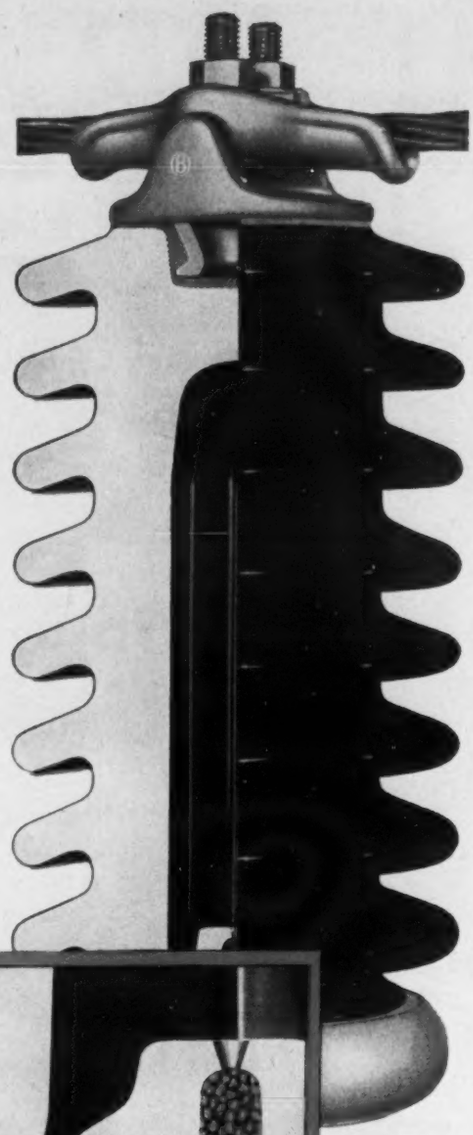
BH PRODUCTS

NON-BURNING IMPREGNATED MAGNETO TUBING • NON-BURNING FLEXIBLE VARNISHED TUBING • SATURATED AND NON-SATURATED SLEEVING

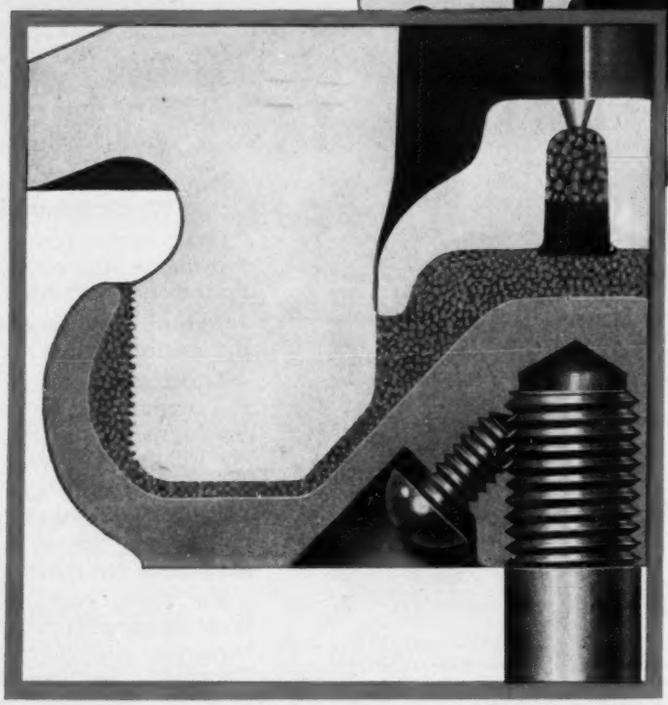
BENTLEY, HARRIS MANUFACTURING CO.
Conshohocken, Penna.

INDESTRUCTIBLE PORCELAIN SEAL

Guards Performance of O-B LINE POST



The excellent dielectric and radio-silent characteristics of the line post depend upon the insulating quality of the interior cavity in series with the porcelain head. Any moisture inside this chamber eliminates a major portion of this insulating combination and renders a post liable to electrical breakdown. Obviously, permanent dryness of the internal cavity is paramount in post design, and this is dependent on perfection of the seal...O-B Line Posts are sealed with a porcelain barrier glazed into place. This substantial design also provides a unique check, since the firing temperature that melts the glaze also evacuates the chamber. Later, the barrier is pierced and the vacuum in the cavity is measured; giving positive proof of air-tightness before being filled with dry, inert gas and going into service. Furthermore, nothing can ever happen to porcelain to alter this condition...Not only does the O-B ceramic barrier permanently seal the internal cavity, but it also uses no perishable or war-critical materials. The good performance of O-B Line Posts is assured by the use of porcelain throughout their construction--porcelain that has never been known to change or deteriorate.



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Ohio Brass

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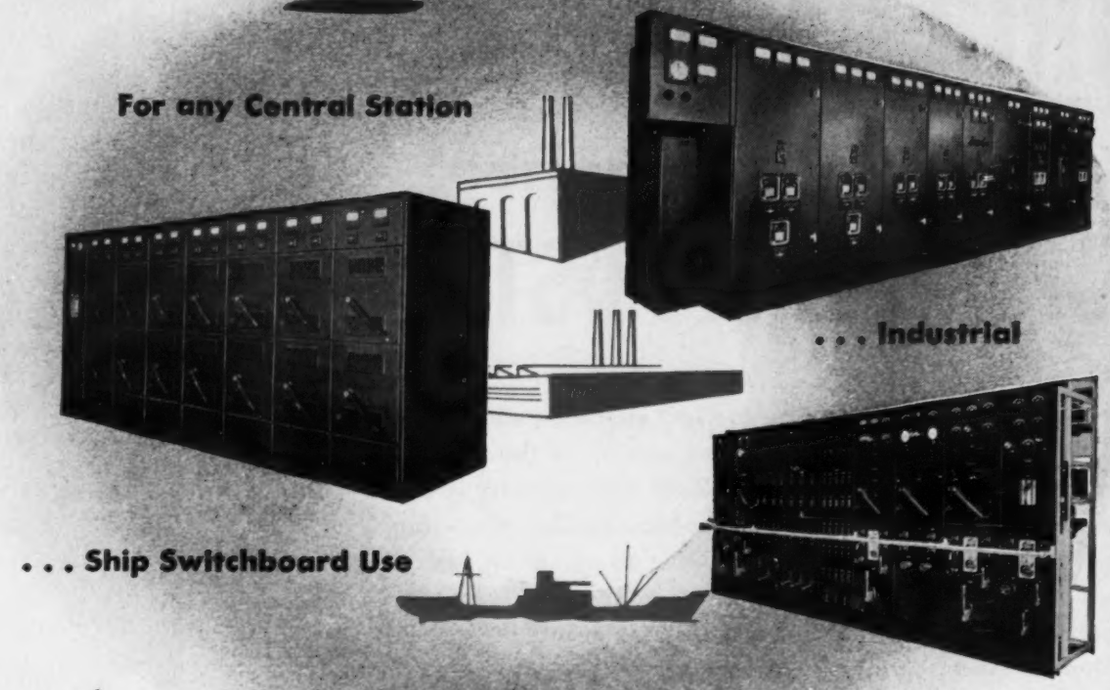
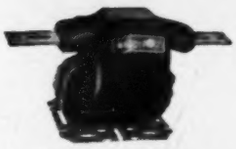
CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Your Best Bet —

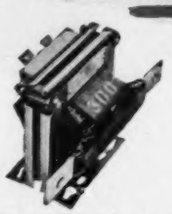
TO GET THE RIGHT INSTRUMENT TRANSFORMER



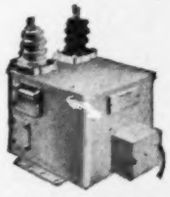
-select from the complete Westinghouse line!



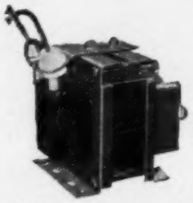
Type CT Indoor Current Transformer for 5, 8.7 and 15-kv service built to the standardized EEI-NEMA dimensions and performance.



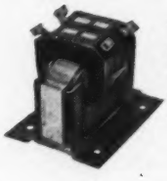
Type KO Indoor Current Transformer for 5,000-volt service. Dependable metering accuracy . . . lower burdens.



Type PT Indoor Potential Transformer. Primary rating 230 to 14,400 volts. High accuracy . . . heavy burdens . . . high impulse level.



Type VS Indoor Potential Transformer. Primary rating 230 to 2,300 volts. Metering accuracy . . . heavy burdens . . . small size and weight.



Type CV Indoor Potential Transformer. Primary rating 115 to 600 volts. New lightweight design . . . small size . . . high accuracy . . . heavy burdens.

Regardless of your requirements, you'll do better by standardizing on Westinghouse Instrument Transformers.

First, completeness of line assures your getting the *one* unit that meets your specific size . . . weight . . . mounting . . . burden limitations . . . with highest accuracy.

Second, you benefit from uniform standards of manufacture and performance.

Third, you realize tangible benefits from Westinghouse research and manufacturing experience on all types of transformers. The development of Hipersil steel, which carries ⅓ more flux with less weight, is a case in point.

Five units (as illustrated) meet 80% of all requirements, but many more types and sizes are available. See your Westinghouse Instrument Transformer Catalog No. 45-000 . . . make it your *standard* reference.

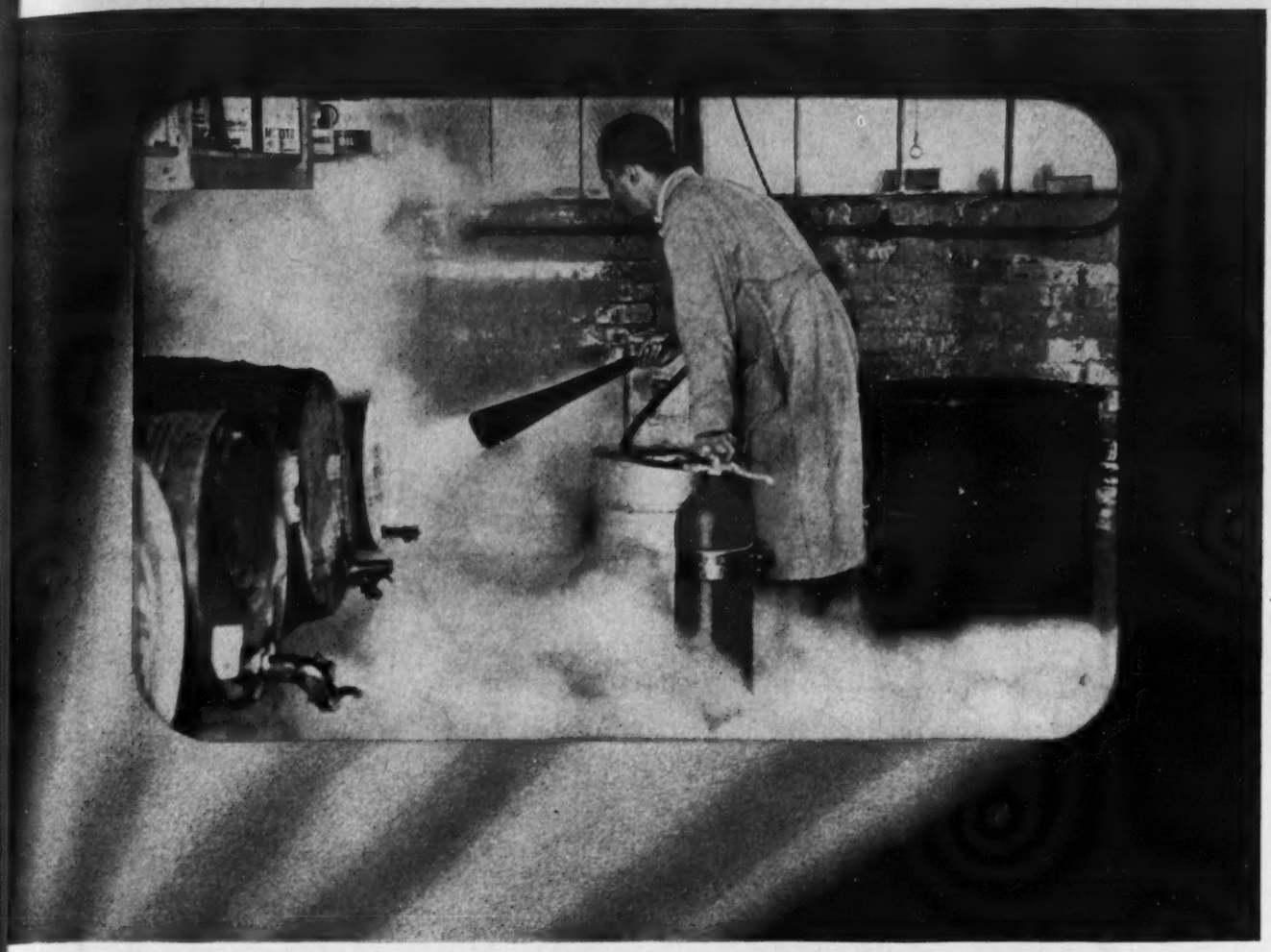
For Navy and other jobs requiring highly specialized units, Westinghouse furnishes Instrument Transformers built to specifications. Ask your Westinghouse Representative for details. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., Dept. 7-N.

J-70405

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

INSTRUMENT TRANSFORMERS



The villain of this film threatens your plant, too!

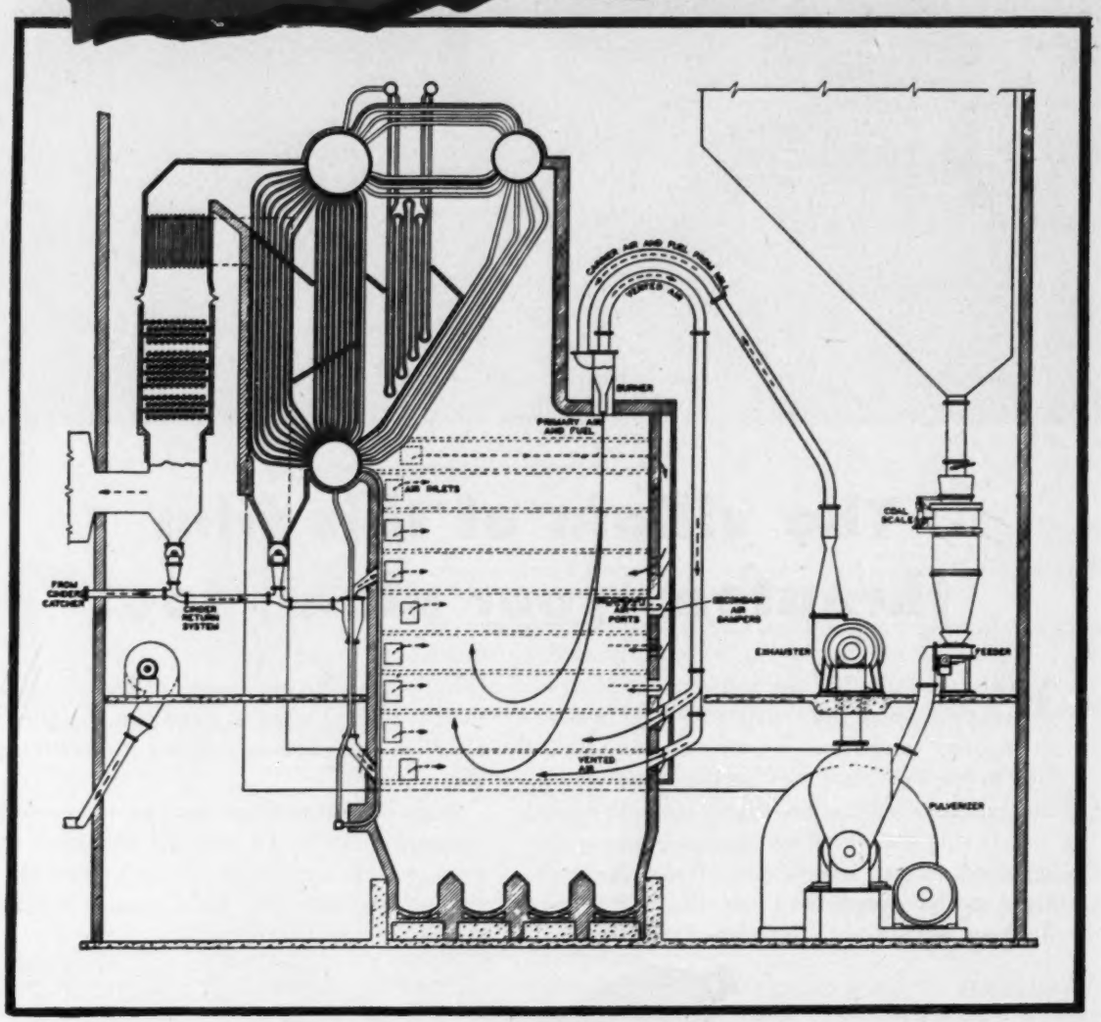
FIRE, the saboteur, can destroy your plant — even though you've installed the most modern fire-fighting equipment! If your men don't know how to operate it, or if they use the "right" equipment against the wrong fire, disaster can easily result.

Believing that visual instruction is easiest understood, longest remembered, Walter Kidde & Company have produced a color film with sound. It shows exactly what to do when fire strikes. It pictures the different classes of fire, shows how to fight each of them. It's fast-moving, grips the attention of its audience during the twenty minutes of its run.

We'd be glad to show this film to key men at *your* organization. There is no obligation whatever for this service. Just drop a line today to the address below and we'll arrange a showing at your convenience.

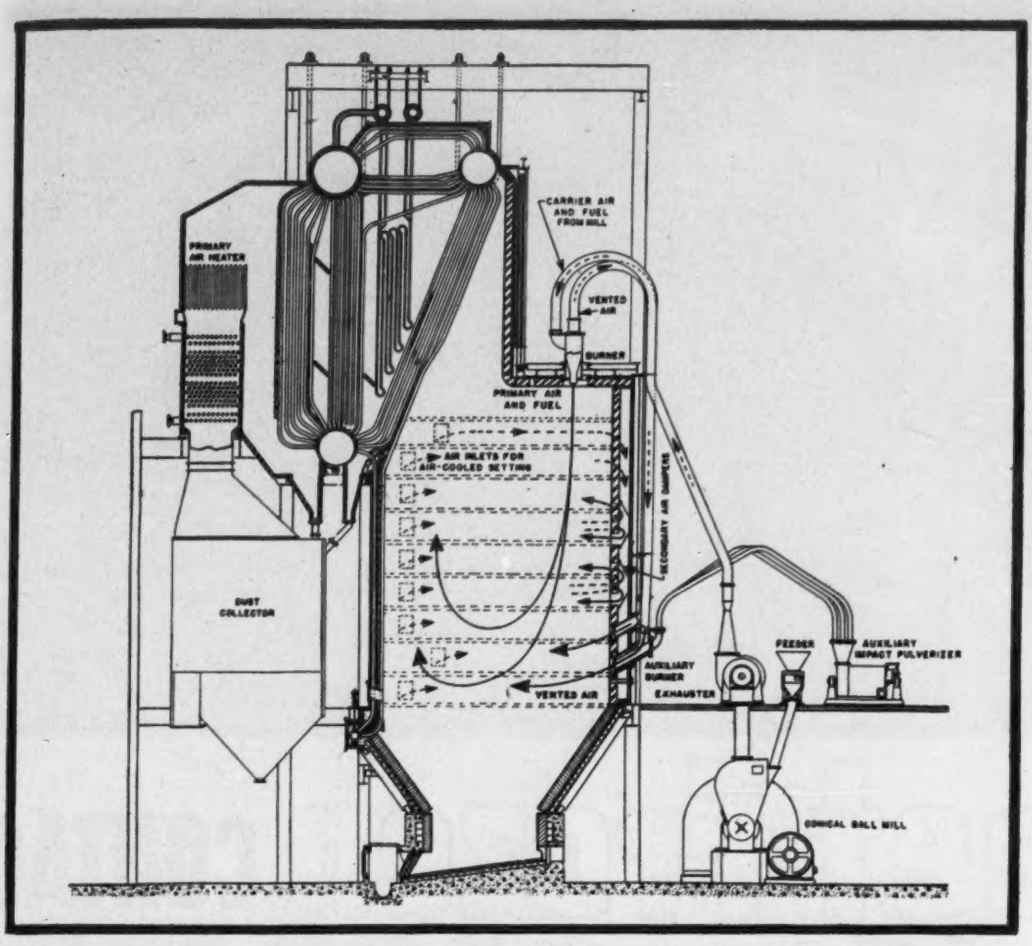
WALTER KIDDE & COMPANY, INC., 1026 MAIN STREET, BELLEVILLE, N. J.

20-50% SAVED BURNING ANTHRACITE FINES



This 150,000 lb. per hour steam generator operating on low cost anthracite saves 50% of fuel costs of bituminous required for the same rating.

FW **FOSTER**



Sectional drawing of a 175,000 lb. per hr. high efficiency steam generator which operates on pulverized anthracite. This is one of 2 duplicate units recently installed in a large Eastern paper mill

Three steam generators fired with pulverized anthracite have been continuously operated for several years in two prominent boiler plants. Fuel costs of the unit located nearer the anthracite fields are 50% less than if bituminous was fired, while the other installation, situated at greater distance from the mines, effects a corresponding saving of 20%.

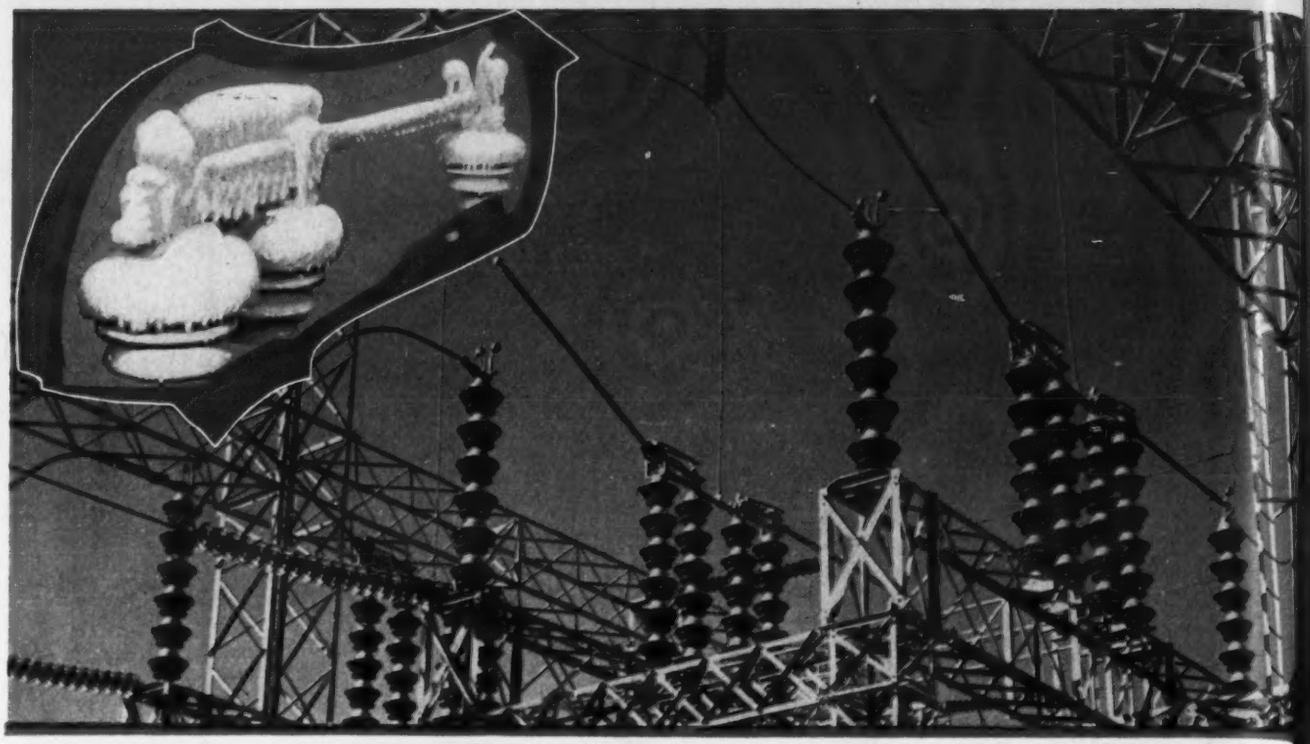
For many years "bin" storage systems were necessary adjuncts when burning pulverized anthracite. Fuel characteristics plus limitations in the pulverizing equipment made these complex and expensive applications necessary for safe and continuous operation.

Then came the Foster Wheeler "unit" system for pulverized anthracite. Specially designed pulverizers, burners, furnaces, boilers, superheaters and heat recovery equipment were all integrated into a single unit to pulverize and fire anthacite continuously and as required. "Bin" storage was eliminated and the new installations showed a continuous record of high efficiency, low maintenance and stable furnace conditions under fluctuating loads. The first unit has now pulverized, in highly successful operation, 225,000 tons of anthracite having an average Btu value of 10,500 and average ash content of 15%.

For more than seven years pulverized anthracite has been successfully fired in Foster Wheeler "unit systems". Commercial operating records of the seven units already in service show uniformly economic and efficient performance.

FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, N. Y.

WHEELER



Sleet-Frozen CONTACTS ..yet Easy OPERATION

PACIFIC ELECTRIC

Switch-Blade Rotates before Moving in its Vertical Arc

Type TW-3; photo shows Special Selector Arrangement, 196-kv., 1200-amps.

Where sleet conditions are bad, here's a Pacific Electric Air-Break Switch that operates easily, even though contacts are frozen solid with ice.

Movement of the operating handle first *turns* the blade and splits the ice at both contact and hinge *before* the blade starts moving in its vertical arc.

When frozen in its open position, the chisel-like blade cuts into and knocks off the ice.

You have no hazardous switch conditions when sleet pulls lines down.

Being counter-balanced, the switch is easy to group-operate at all times. Contacts are of the high-pressure type with silver inserts for full current-carrying ability.

For 37 years the Pacific Electric Mfg. Corporation has specialized in high voltage switching equipment and were the first to make air-break switches of high voltage for use under all weather conditions. You can be assured of long reliability and low upkeep, just as other utilities have experienced the nation over when using Pacific Electric switches of any size.

Ask for full details on these switches which break through ice and operate easily because the blade rotates before moving in its vertical arc.

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Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, 24, CALIF. DUNES HIGHWAY, GARY, INDIANA

Free Enterprise

WHAT IS IT? HOW DOES IT WORK?

☆

OURS is a free-enterprise economy the chief motivating forces of which are the prospective rewards for effort and risk-taking. Its smooth operation depends: first, on adequate incentives for risk-taking, innovation, and individual effort; and second, on sufficient competition to minimize the need for government regulation and to prevent artificially high prices or wages from being maintained in large segments of the economy. Trouble comes when these incentives and this competition are tampered with or removed.

America was founded by men who had the urge to better themselves and the courage to take a chance. These men uprooted themselves in Europe and braved the unknown. They risked all for freedom. They knew that, to be free, they had to attain economic freedom. Their goal was an economic freedom which permits the private ownership of property, the free choice of jobs, and free entry into entrepreneurial pursuits. Their efforts, therefore, were directed toward individual opportunity with no limit on individual achievement. Their foresight and the endeavors of those who followed them created the world's greatest industrial nation enjoying the highest standards of living.

We can take pride in the knowledge that our country has been the greatest single contributor to the world's physical assets even though we remember that an abundance of natural resources contributed materially to America's economic development. But the fact that our progress has been interrupted, again and again, by depressions which resulted in enormous wastes of our human and material resources is sobering proof that our economic mechanism still is far from perfect.

Our production per man-hour has been increasing at the rate of 2½% per year. Improved machines and greater efficiency have more than tripled the output per hour of work since 1900. Looking to the future, this annual rise indicates that our production per hour of work will double in the course of the next 25 to 30 years. This means that we can have twice our present volume of goods and services per capita or an equivalent combination of more production and more leisure. In other words, we can further increase the living standards and further decrease the working hours of the American people by further intensifying our industrial efficiency.

This is no idle dream. It can be achieved, and it will be achieved, if only we maintain the essential features of our system of individual enterprise which alone makes possible this near-utopian goal. Intensification of our efficiency, however, means that we can have full employment only if we expand enormously our production, and particularly our production of new goods. We can expand total production only if we have the markets and the demands for the vast output of goods and services made possible by our technological development. To attain these, we will need to venture into new markets, new inventions, and new methods. Such ventures involve risks, and risks will be taken only if there is sufficient prospect of reward.

Let us never lose sight of the fact that the essential features of free enterprise are the prospective rewards for risk-taking as well as for effort.

The evidence is clear that incentive methods of wage payments will boost production. Carefully devised systems of salary payment with large differential inducements for superior performance have been powerful means of raising the standards of managerial accomplishment.

Free enterprise cannot operate effectively unless the wage and salary system offers greater rewards for greater effort. Neither can it operate effectively unless the prospects for profit are sufficient to encourage the employment of resources which otherwise would be kept idle.

Unless the prospects of profit are superior to the prospects of loss, new ventures will not be undertaken and going concerns will not expand or continue long in business. When the hope for profits wanes, employment and production slump; when that hope revives, employment and production recover.

Business initiative must be given every possible in-

ducement in order that maximum employment may be achieved through private enterprise. This involves the removal and avoidance of restrictions on business by government, by labor, and by business itself.

Competition is the life-blood of the free enterprise system. Business and industry must rely upon efficiency rather than upon protection from competition for their survival.

Those government controls which were made necessary during the war by the magnitude of government demands for goods should be lifted at the earliest possible moment. As soon as the danger of inflation has receded, price controls must be removed and profit margins again left free to be determined by market forces. The excess profits tax must be repealed and the burden of other taxes on business profits greatly reduced. Tax laws should be revised so as to permit adequate rewards for assuming risks. The modernizing of anti-trust laws and their vigorous enforcement, not indiscriminate persecution, will be supported by all who really want free enterprise. Such measures will strengthen the incentives to expand old businesses and to start new ventures.

Grants of unlimited monopoly powers to labor unions which enable them, consciously or not, to sabotage the profit incentive in business must be withdrawn. Labor has certain legitimate rights; and in order to preserve them and its freedom, labor must come to realize that its best interests lie in a well functioning, self-disciplined competitive free-enterprise economy.

There must be evolved in the minds of business, labor, and the public a recognition of the need for private business enterprise and a realization that policies which throttle it are harmful not only to businessmen but to workers and consumers as well. Unless we achieve this understanding and avoid needless deterrents to business expansion, we are likely to pay for our folly in the destruction of our free enterprise system.

We cannot tolerate conditions in which special interest groups in business, labor, agriculture, or politics prevent free access to the market by would-be competitors. Such monopolizing of opportunities stifles progress and creates profits or wage rates based on artificial scarcity. In such cases government interference to open the market to all comers is clearly indicated. We must recognize the need for constructive policies by business, labor, and government which will insure the competition necessary for the successful operation of our economy.

Increased government regulation and control of business activities is not conducive to strengthening the virility of private enterprise. Government ownership and operation of productive resources certainly is not to be condoned. The more government rules and regulates business, the less will be the incentive to assume risks and to exercise individual initiative. Government regulation of the detailed operation of industry inhibits progress, is prey to political pressures, and is subject to the human failings of its administrators. *Better far the rough guidance and justice of vigorous, though somewhat imperfect, competition than the uncertainty of arbitrary regulation.*

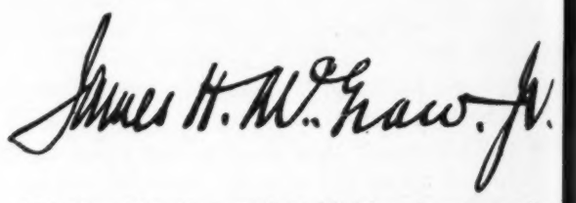
The gravest threats to our competitive system exist in legalized monopolies, such as the N.R.A. once comprised, such as the labor unions and farm groups have recently achieved, such as businessmen themselves have sometimes sought. The power of labor monopolies to encroach on business profits will tend to interfere seriously with the needed flow of new investment. And when any group is strong enough to move the average level of costs as much as the labor groups and the farm groups are able to do, there is good reason to fear that, when we begin to approach high levels of employment and production in time of peace, these groups will induce a price-wage spiral which will waste money incomes on price increases instead of permitting them to draw unemployed resources into production. While the demands of labor for collective bargaining rights and the demands of farmers for protection against the rigors of depression have validity, there can be no reason for excessive grants of power and privilege which threaten to make our system of free enterprise unworkable.

Ours is a complex economic structure. The functions which prices, income, savings, investments, and taxes play in this system are difficult to comprehend.

As I have said before: Thinking is hard work, and we will have to work hard if we are to develop business policies, labor policies, and government policies which will insure full employment and the opportunity for consistent profit. Yet only through such policies can we guarantee that private enterprise will be the predominant source of jobs, income, and production.

Even more difficult than thinking, and more important, is the implementation of many policies that are in the interest of the free enterprise system. Not all measures will satisfy all people. Special interests will have to be subordinated to the total interests of the nation. Sacrifice and vision have been essential to the winning of the war. They will be no less essential to the winning of the peace.

If we can gain recognition of the crucial role of incentives for enterprise, if we stand squarely for competition and against protection or privilege for special interests, and if we bend our efforts to find satisfactory ways and means to prevent large-scale unemployment, we can have the full benefits which only a free enterprise system can produce—in industrial progress, in improved standards of living, and in the preservation of our democratic ways of life.



President, McGraw-Hill Publishing Company, Inc.

Welding Cables for WAR WORK

SUPER-FLEXIBLE, RUBBER SHEATHED, WELDING CABLES have for many years been one of the most popular of the Simplex-TIREX cables that are designed to meet the particular requirements of a specific industry. Simplex-TIREX welding cables were engineered to fit the operating conditions and millions of feet are now in service in mines, shipyards and wherever electric welding is being done. These prewar Simplex-TIREX welding cables are making a valuable contribution to our war effort.

Recent government regulations prohibit the use of natural rubber for cable insulation or protection and, for the duration, synthetic compounds must "stand in" for them. Such compounds have been developed and are now being used on all Simplex "War" TIREX cables.

SIMPLEX *War* TIREX welding cables are available for essential industry engaged in war work, subject to the rules and regulations governing the use of copper and other strategic materials. If electric welding is of interest to you, Simplex "War" TIREX welding cables also will be of interest.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex WIRES and CABLES

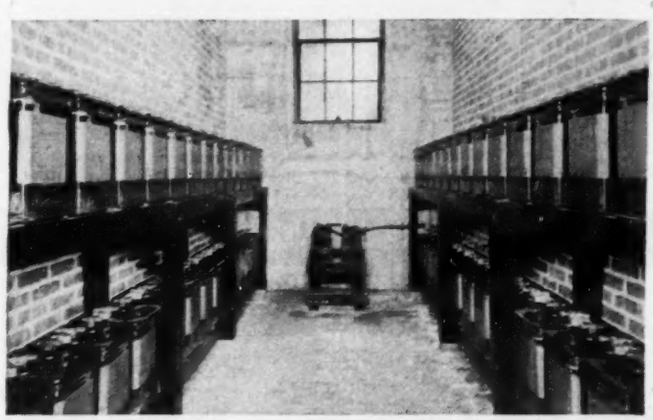
There's a good reason why Tulsa chose Exide

BUY TO LAST
SAVE TO WIN

Tulsa Power Station of the Public Servi
Company of Oklahoma . . . Exide-equipp

WHEN the Tulsa Public Service Company of Oklahoma installed a new battery in April 1941, an Exide Chloride was their natural choice . . . and with good reason.

They already knew the rugged dependability of an Exide Chloride Battery, for one had been in operation at their plant for 16 years. Installed in 1925, it was in operation until 1941, a type of record repeated again and again by these fine batteries. No wonder Public Service Company sticks with Exide. They're built to last and will serve to win.



Public Service Company's Exide 60 Cell EM-15 Chloride Battery, installed for added protection, efficiency, safety.

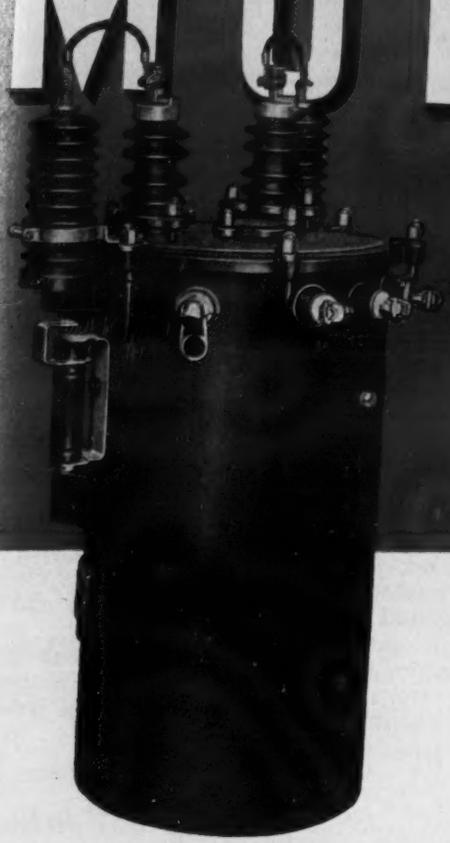
Exide
CHLORIDE
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toron

MOLONEY CSP*

*COMPLETELY SELF-PROTECTED

TRANSFORMERS



Self-Protected Against Damage Resulting From

1. OVERLOADS

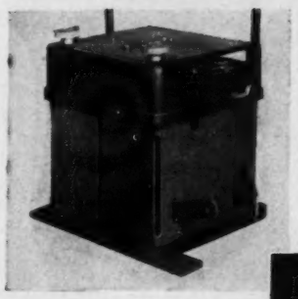
2. SHORT CIRCUITS

3. LIGHTNING

EXCESSIVE overloads and secondary short circuits cannot damage Moloney CSP transformers. A thermally-operated secondary circuit breaker automatically disconnects the load from the transformer before the winding temperature approaches the maximum safe value. Advance warning of overloading is given by a warning light provided in the breaker operating handle.

Protection against damage resulting from lightning is provided by "De-ion" gaps in combination with a tank discharge gap. Service continuity is maintained under the most severe lightning conditions.

In addition to these features, Moloney CSP transformers are provided with the same plus values featured in Moloney conventional Type KL and CL transformers including: 1. Ratio adjuster operating handle above hot oil level; 2. Uniformly high impulse strength; 3. High thermal capacity; 4. Core-and-coil unit anchored above oil level.



Type TR breaker with warning light contacts. Standard on sizes 5 Kva and larger. Type FR breaker without warning light contacts is standard on 1½ and 3 Kva ratings, but Type TR can be supplied if desired.

Breaker reset handle with built-in warning light. Light goes on when load raises temperature of windings to a dangerous level. Should load continue to increase, the breaker trips. Turning reset handle resets both light and breaker.

MOLONEY ELECTRIC COMPANY • ST. LOUIS, U. S. A.

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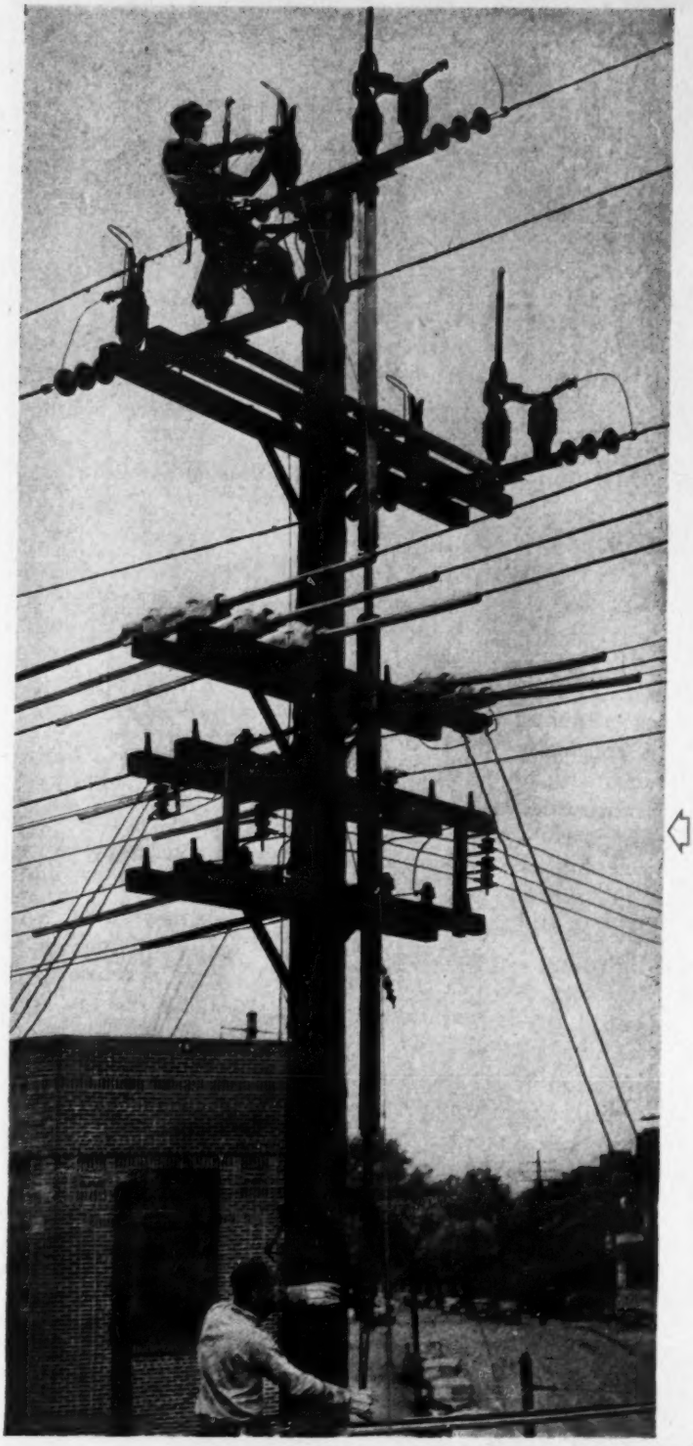
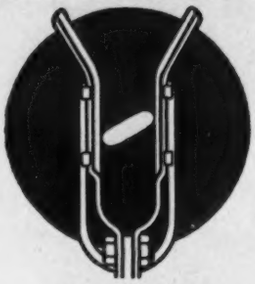
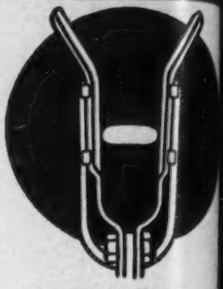
San Francisco, Calif.....420 Rialto Bldg.
Seattle, Wash.....552 First Avenue, South
[illegible].....[illegible]

Just Twist Your Wrist





Blade Turning Between Contacts



Blade Fully Turned for Contact

Rest your elbow on a desk, lower your hand and twist your wrist. Your hand comes down flat—a natural, easy movement.

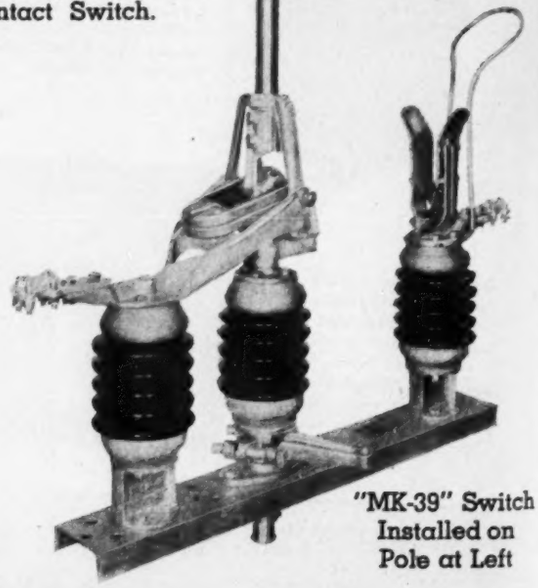
Now consider the blade movement of this switch way up on a pole. When you pull the operating handle located halfway down the pole, the motion is transmitted to the switch mechanism and blades are set in motion.

As the blades lower and approach closed position, all three turn into high pressure connection with the fixed contacts. Like the twist of your wrist, it's a simple, positive movement.

Installing a 15-Kv, 600-A, 3-Pole, Manually Operated "MK-39" High Pressure Contact Switch.

Publications

4109-A and 4209 Give Complete Information



"MK-39" Switch Installed on Pole at Left

DELTA-STAR ELECTRIC COMPANY

MAIN OFFICE AND FACTORY—2400 Block, Fulton St., Chicago 12, Ill.
NEW YORK OFFICE—140 Cedar St., New York, N. Y.

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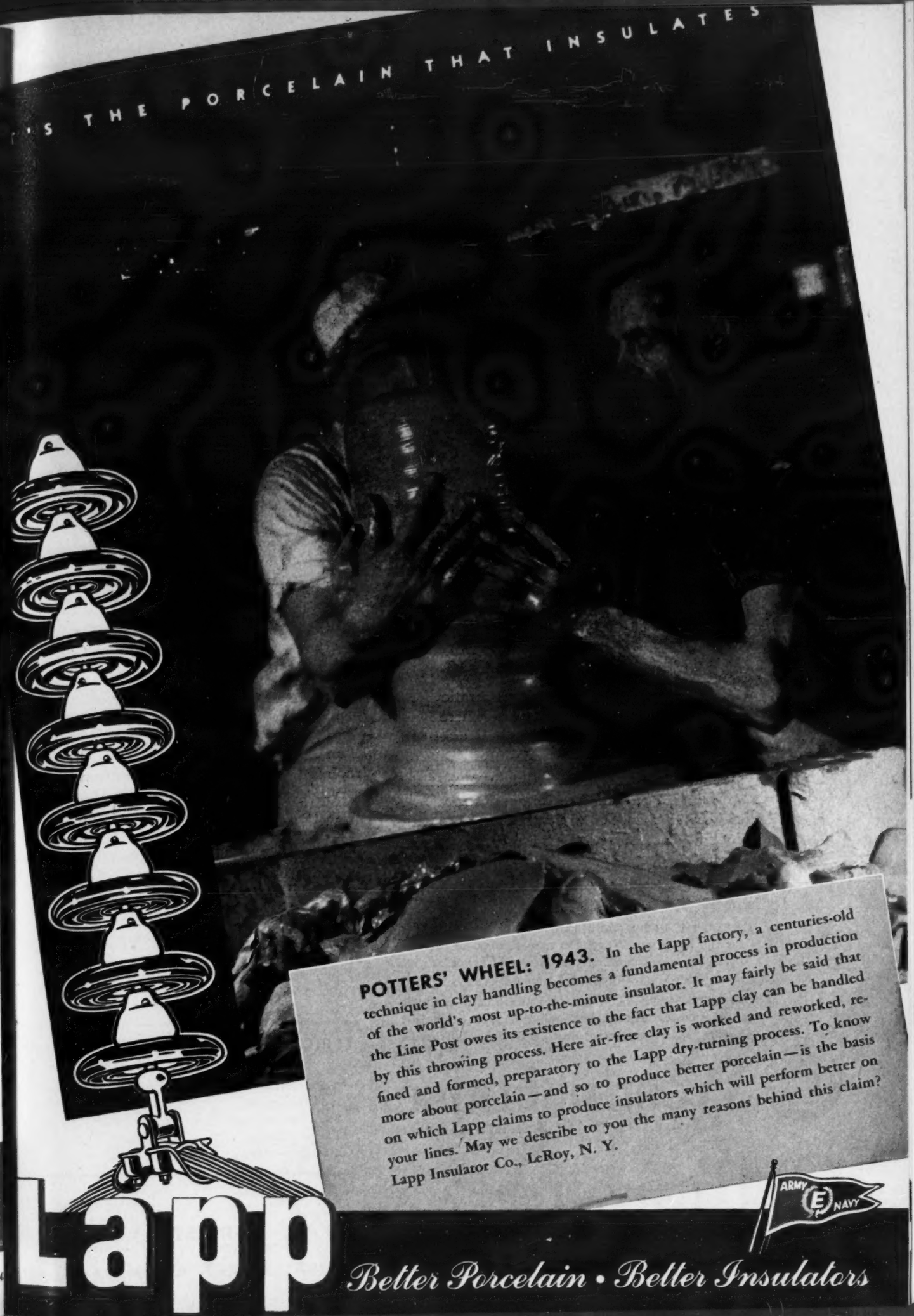
CANADIAN ASSOCIATE

Canadian Line Materials Limited — Toronto 13, Can.



POTTERS' WHEEL: 1943. In the Lapp factory, a centuries-old technique in clay handling becomes a fundamental process in production of the world's most up-to-the-minute insulator. It may fairly be said that the Line Post owes its existence to the fact that Lapp clay can be handled by this throwing process. Here air-free clay is worked and reworked, refined and formed, preparatory to the Lapp dry-turning process. To know more about porcelain—and so to produce better porcelain—is the basis on which Lapp claims to produce insulators which will perform better on your lines. May we describe to you the many reasons behind this claim?

Lapp Insulator Co., LeRoy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

If your present manufacturing operations or postwar plans involve product parts where high dielectric and mechanical strength is essential, consult Westinghouse.

Skilled Micarta engineers will be glad to study your product . . . analyze its applications . . . give you the benefit of 35 years' experience with industrial plastics.

This experience is particularly extensive with respect to applications where effective insulation is necessary . . .

FOR EXAMPLE, IN THE MANUFACTURE OF RADIO EQUIPMENT for the Army and Navy . . . tube sockets, coil forms, variable resistor housings and terminal strips are all made from Micarta plate and tubing.

ON FIGHTING SHIPS . . . Micarta panels are used in circuit breakers that control gunfire equipment . . . in cable cleat blocks used to separate power cables from bulkheads.

AND IN MANY OTHER INDUSTRIES . . . hundreds of thousands of Micarta parts are used where dielectric strength and dependability are vital.

In many of these applications Micarta has replaced unavailable critical materials and is serving better, due to its unusual properties. It's a fact, for instance, if you were to wear Micarta "gloves" ½" thick, you could stand on wet ground and safely handle a high tension wire carrying 250,000 volts.

For complete Micarta data, phone your nearest Westinghouse office or write to Westinghouse Electric & Manufacturing Company, Dept. 7-N, East Pittsburgh, Pennsylvania. J-0634

TYPICAL MICARTA TOUGH JOBS IN WAR APPLICATIONS

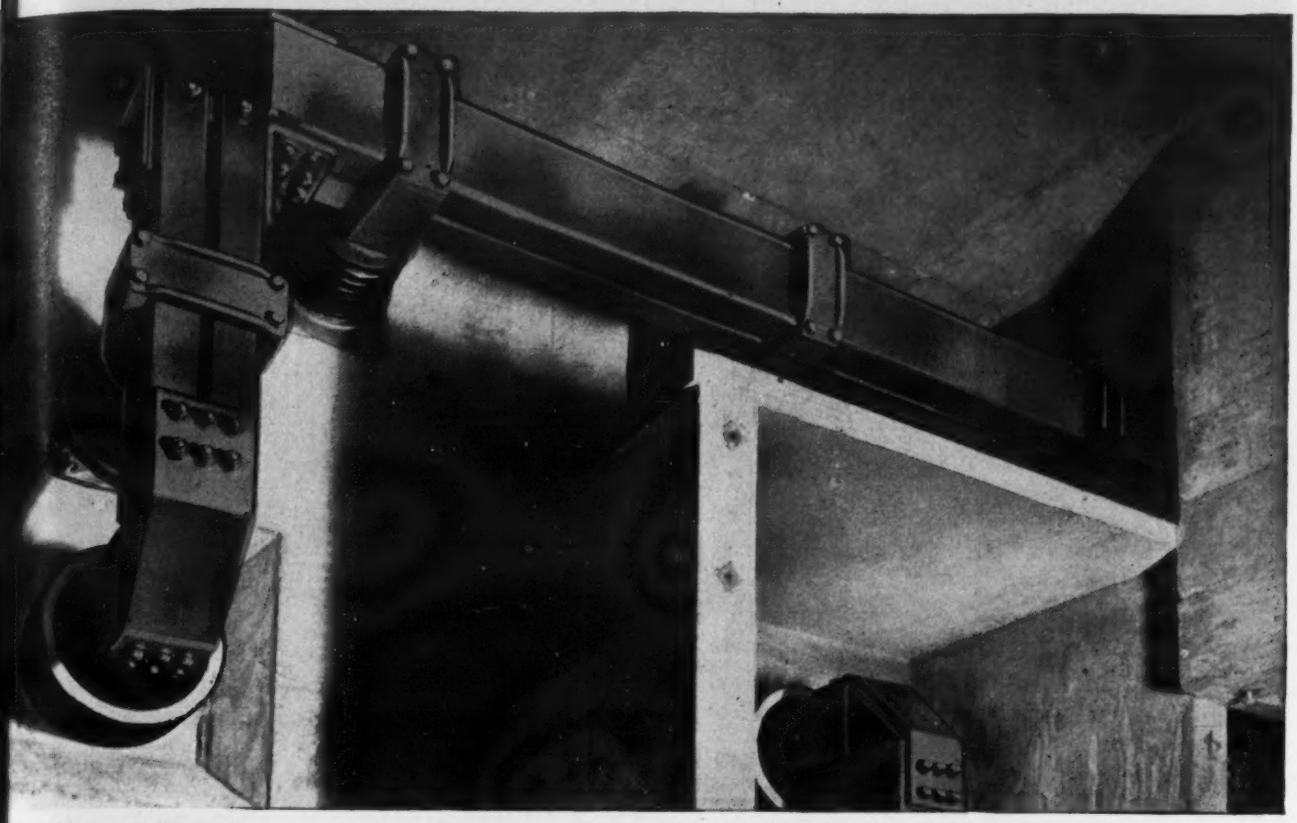
Aircraft structural parts	Protective helmet liners
Industrial gears	Aircraft control pulleys
Steel mill bearings	Bus supports
Thrust washers	Fuse mountings
Marine bearings	Insulating washers

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Micarta

The INDUSTRIAL PLASTIC



View of Anaconda Channel Bus Conductors in the Venice, Illinois, station of the Union Electric Company of Missouri. This station, rated at 240,000 KW, is one of the largest in the world

VENTILATED BUS CONDUCTORS

deliver more power to war production

Because of its high conductivity and consequent low current losses, copper has always been the most widely used material for bus conductors.

To these advantages may be added such further qualifications as high thermal conductivity, high strength, high resistance to corrosion and ready availability of accessory equipment. Wherever modern electrical engineering practice dictates bus construction embodying structural strength, low ohmic and reactance losses or effective heat dissipation, the wide range of copper bus shapes made by The American Brass Company will meet every requirement.

In addition to a complete line of copper bus bars of rectangular shapes, this Company makes high conductivity pipe and tube, stranded cables and many special shapes.

Of particular interest to electrical engineers are the ventilated busses made from channels, angles, tubes and rectangular copper bars. Information, including our Bus Conductor Booklet, C-25, and the suggestions of our Technical Department on various bus conductors and assemblies, is available on request. 43102

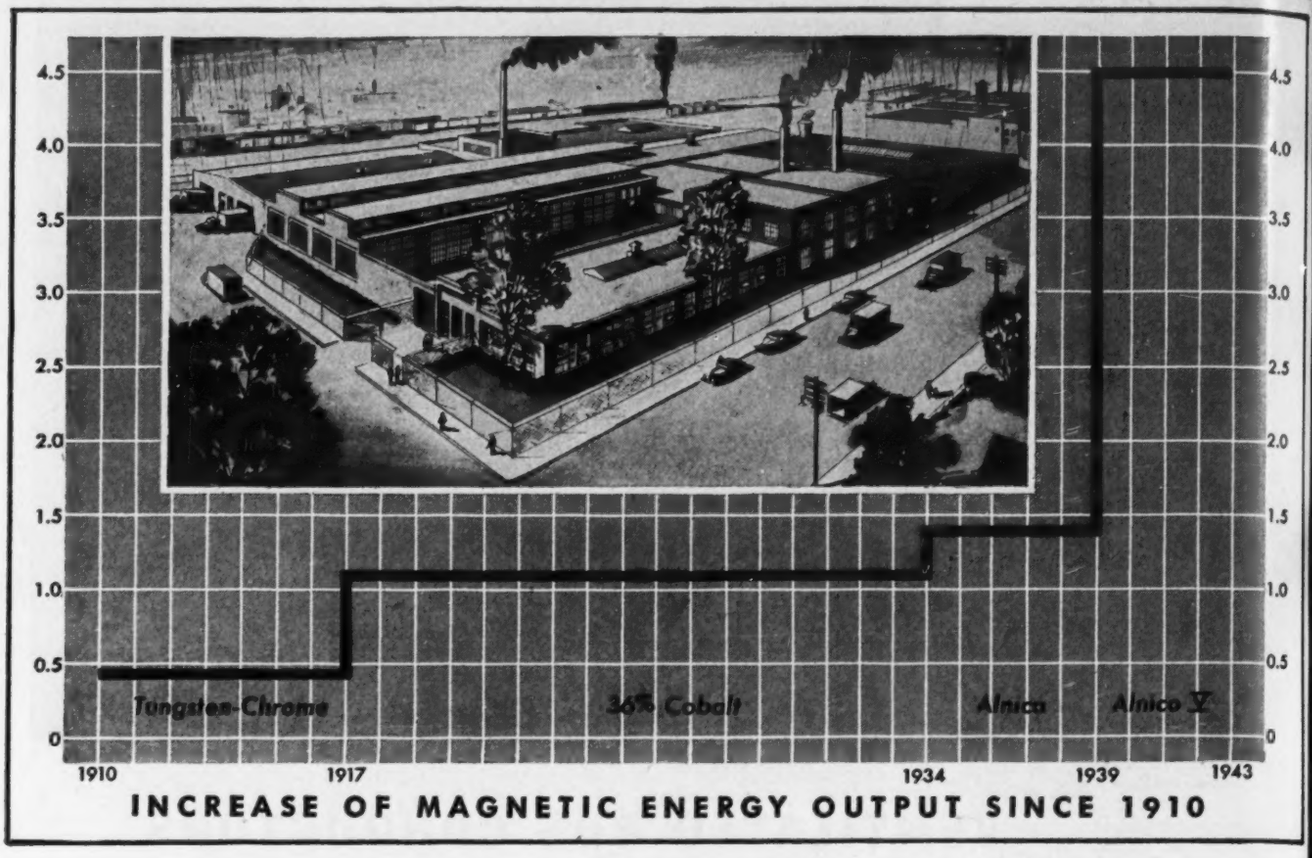
Anaconda Copper

ANACONDA

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company · In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

PERMANENT MAGNETS MAY DO IT BETTER



INCREASE OF MAGNETIC ENERGY OUTPUT SINCE 1910

GOING UP . . . . THROUGH DEVELOPMENT!

THIS CHART shows the increase in permanent magnet energy due to metallurgical research during the past 33 years.

From 1910's conventional horseshoe magnets to today's intricate rotor magnets, we've constantly developed new shapes and new applications from these new metals. And doing this one job especially well has made possible countless new products, including some of the war's most complicated devices.

If you are planning war or post-war products, we'd like to suggest that you consider incorporating the principle of the permanent magnet—and that you utilize the services of the largest exclusive maker in this field. Chances are that permanent magnets will improve the functions and increase the uses of your products, and they may even bring to light possibilities that you hadn't thought of before.

Though our plant is devoted entirely to war orders, our engineers will be glad to consult with you. Write for the address of our office nearest you and a copy of our 30-page "Permanent Magnet Manual."

Two Ways to Back the Attack: Buy More War Bonds and Increase Production!

The
INDIANA STEEL PRODUCTS
Company

★ SPECIALISTS IN PERMANENT MAGNETS SINCE 1910 ★

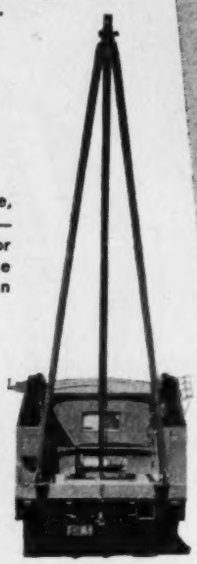
6 NORTH MICHIGAN AVENUE • CHICAGO 2, ILLINOIS

FWD LINE CONSTRUCTION AND MAINTENANCE EQUIPMENT THAT CONSERVES CRITICAL TIME AND MAN-POWER

Model 1775 Pole Trailer Especially adapted for high-speed hauling of poles over short and long distances. Because of its wide tread, this unit trails at high speeds without snaking or whipping. Light in weight, two men can easily lift it onto a truck when moving from one operation to another.

Sure Binder (Handiest tool you ever used) The Sure Binder is a portable hand winch for binding bulky loads of all types. Ratchet type drum holds 18 ft. of 5/16 inch cable. Weight complete: 18½ pounds.

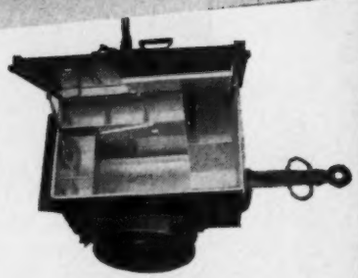
tility Pintle Hooks Provide a sure, fe connection between truck and trailer— any make of truck. Available in sizes for lling loads of 1 ton or less and up to the niversal type for towing anything that can moved.



Type Pole Derrick Made of best seamless steel tubing properly t treated. Available in sizes to handle es from 25 ft. to 70 ft. in length.

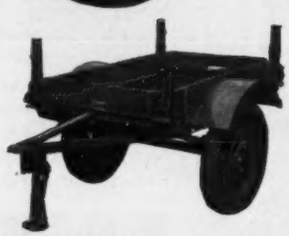
First Choice OF MORE THAN 150 UTILITIES

FWD offers a complete line of engineered trucks for Utility service. Special power take-offs for operating a winch and boring machine are incorporated into its original design. FWD builds its own cabs and Utility bodies—can furnish conventional or over-engine cabs with seating capacity from 2 to 7 men...Write for FWD catalog. "PUBLIC UTILITY TRUCKS THAT FOLLOW THE JOB."



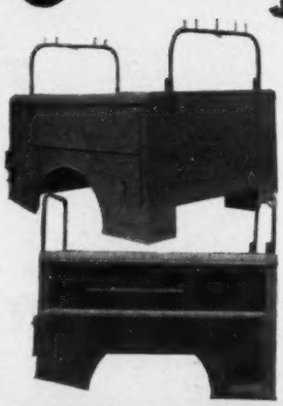
Cable Splicer's Cart—Model S All steel construction—compact—rugged—theft-proof. Compartments for every tool. Folding support leg. Capacity 1000 lbs. Available with either solid or pneumatic tires.

Combination Cable Reel and Pole Trailer This unit has electric steel spoke wheels of integral hub type. Timken roller bearings, and special heat treated chrome vanadium steel springs. All castings are electric steel cast. Axle material is 40-50 carbon steel, specially heat treated. The main frame and cross member 4", 9½ lb. I-beam. All trailers furnished with one set of pole hauling bolsters, and one set of cable reel saddles.



Combination Cargo and Pole Trailer

P8T Series. Available in heavy load capacities of 3100 to 8200 lbs. Extension tongue permits hauling of poles up to 40 ft. Optional electric brakes, side boards, stanchions, etc.



B-6 All Purpose Body

A light weight compact all steel body designed for installation on any half ton chassis. Complete unit weight does not exceed 600 lbs. Storage compartments contain over 54,000 cubic inches. Full height clothing and material compartment. Corrugated steel floor, reduced weight increased strength. Full standardization of design permits easy replacement of damaged body parts or complete sub-assemblies. Tail gate can be secured at 45 degree position, level with floor or fully dropped. Rear ladder bracket removable. Telescoping door stops and solid wood insert converts upper rite door to full length work table and vise holder.

OTHER UTILITY TOOLS

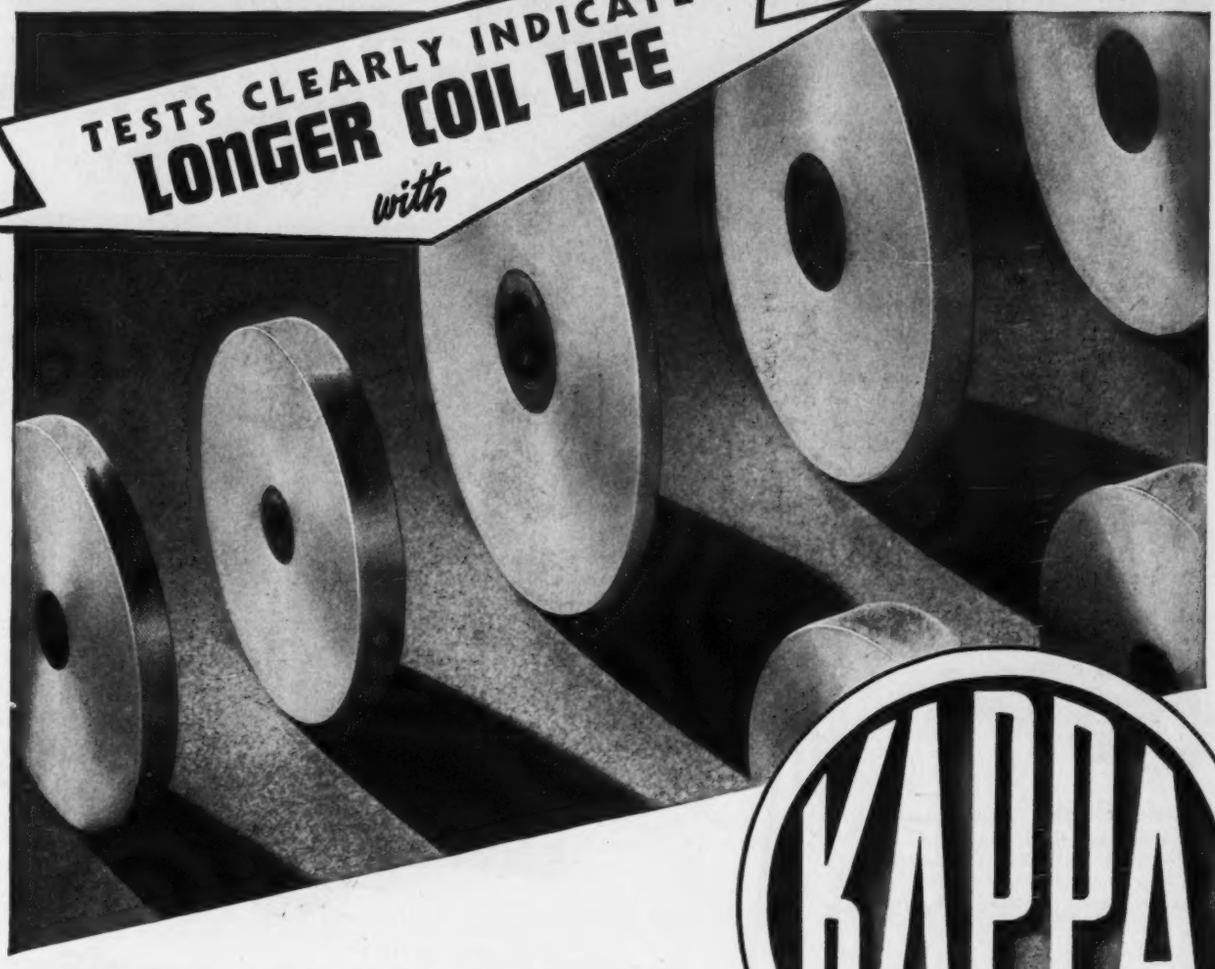
- Earth Boring Machines
- Power Take-Offs
- Duct Rodding Machines
- Low Bed Trailers
- Trailer Hitches
- Cable Laying Plows
- Steel Utility Bodies For Pick-Up Trucks
- Guy Wire Forming and Cutting Tools

SEND FOR LITERATURE

Distributed and guaranteed by GraybaR ELECTRIC COMPANY

THE UTILITY SUPPLY DIVISION of the FOUR WHEEL DRIVE AUTO CO., CLINTONVILLE WISCONSIN

TESTS CLEARLY INDICATE LONGER COIL LIFE *with*



KAPPA

Trade Mark Reg U S Pat Off.

● Impartial and carefully controlled tests covering the factors that principally affect the life of taped and varnished insulation . . . namely, aging, temperature and accompanying physical changes in both varnish and fabric . . . show that the inherent characteristics of Kappa Cellulose Acetate Rayon Tapes may be expected to result in substantially improved performance over materials previously used.

In addition, Kappa Tapes accept varnish impregnation in a remarkably superior manner, resulting in a uniform and complete insulation seal that is free from "pin holes" and surface fibres . . . with less increase in thickness and requiring fewer varnish dips for a given dielectric specification.

Detailed results of electrical and physical tests, together with full information, are contained in our engineering data bulletin which will be sent on request. At the same time we will be glad to send long length samples for your own tests in the widths and mil thicknesses you regularly use. Kappa Tapes are IMMEDIATELY AVAILABLE in standard widths and consistent mil thickness . . . including 10 mil and 3-mil. Write to The Wm. E. Wright & Sons Co., Industrial Textile Division, Box 1000, West Warren, Mass.

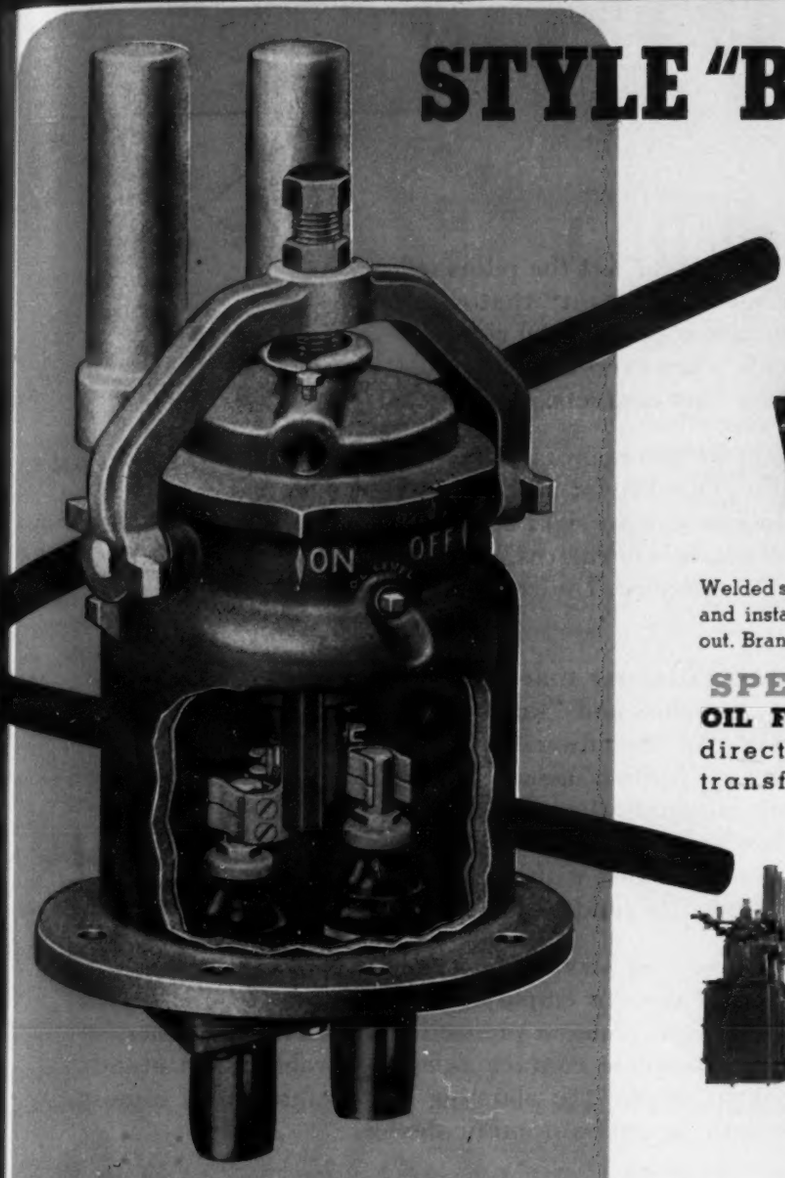
Complete tests and Technical Data and prices in this new Bulletin, free on request.

CELLULOSE-ACETATE RAYON

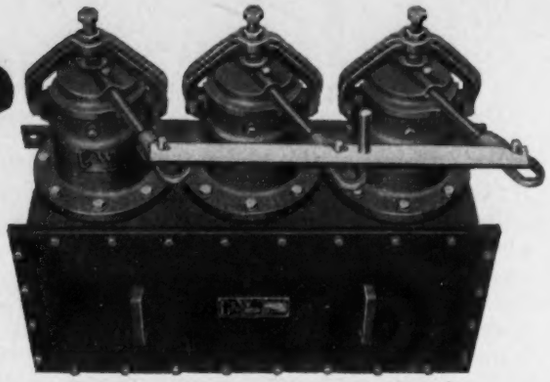
COIL-WINDING TAPES

The Wright tape for every winding.. KAPPA

G & W TYPE "FC" OIL FUSE CUTOUTS



STYLE "B" WITH GASKETED FLANGE FOR MOUNTING ON BOXES



Welded steel boxes, factory assembled with oil fuse cutouts, save space and installation labor. Main circuit cables can be brought in and out. Branch circuit or transformer taps can be made within the box.

SPECIFY G & W OIL FUSE CUTOUTS directly attached to transformers.

Secure the advantages of unit metal enclosed construction with the cutout box bolted or welded to the transformer.

The years of trouble-free service has created a wide acceptance of G & W Type "FC" Oil Fuse Cutouts. The modern design provides interchangeability of parts for various installation conditions. The interlocking cover and cover clamp insures safety in fuse replacement. The simple and inexpensive fuse link universally fits all Type "FC" cutouts.

½ cycle interruption of short circuits protects equipment.

Beryllium copper springs make ideal full load break switching contacts.

Send for Bulletin No. 425

G & W ELECTRIC SPECIALTY CO.

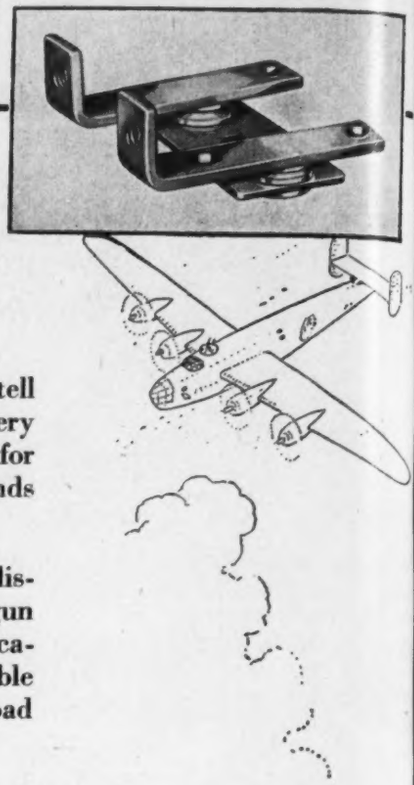
7780 DANTE AVENUE CHICAGO, ILL., U. S. A.

Also made in Canada by Powerlite Devices, Ltd., Toronto

GANG OPERATED

FOR FUSING AND SWITCHING PRIMARY CIRCUITS SUBWAY – OVERHEAD – VAULTS

Every Part is Most Important at the Time It Does Its Job



What part of a plane is most important? Let the pilots tell you that. All we know that it is "most important" that every phase of the contact parts we produce is perfect and right for the job they do. The time may come when everything depends on the accurate functioning of those tiny contacts.

Contact materials are all important as one manufacturer discovered. He was making an amplidyne relay for airplane gun turret controls. The relay had to conform to rigid specifications and carry approximately 100 amperes of current. Trouble developed from the contact material specified. Under overload tests, the contacts stuck.

The manufacturer was pressed desperately for time. He consulted Mallory engineers. Their experience and "know how" cooperated to find a swift answer. An exceptional Mallory Elkonite fitted the need. A Mallory contact assembly was developed. Not only did the result eliminate the sticking, but obtained, in actual operation, a low millivolt drop. Further, a backing of Mallory 3 metal was recommended with the result that the complete assembly functioned beyond expectations.

While the design is still in blueprint form

CONSULT MALLORY
for Contacts and Contact Assemblies

Mallory engineering service is most important in cooperating with design of devices employing contacts because it represents years of progressive pioneering in solving numberless contact and complete contact assembly problems. It stands ready to help, if you are planning the production of almost any automatic or semi-automatic device.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA
Cable Address—PELMALLO

ELKONITE: Reg. U. S. Pat. Off.

P R MALLORY & CO. Inc
MALLORY

ELECTRICAL CONTACTS AND CONTACT ASSEMBLIES . . . NON FERROUS ALLOYS POWDERED METAL ALLOYS

What

PANELYTE *

can do for you!

1 ELIMINATE COSTLY EXPERIMENT

The properties of the 32 grades of PANELYTE laminated resinous structural plastics are clearly defined and as easy to evaluate as different steels. PANELYTE should not be considered as a substitute for any natural or manufactured material — but as a "preferred material" for applications calling *for the unique combination of electrical and mechanical properties found only in PANELYTE.* To specify the correct PANELYTE for a given application, our engineers have only to know the exact requirements for the part.

2 SPEED PRODUCTION

Many manufacturers are cutting days — sometimes weeks — from production schedules by using molded PANELYTE parts. By simplifying assemblies and reducing number of parts needed, both time and money are saved. PANELYTE (paper, fabric, wood veneers, fibre glass, and asbestos base) is made in Sheets, Rods and Tubes.

3 FURNISH MOLDED OR FABRICATED PARTS

PANELYTE structural parts are molded or fabricated to your exact specifications — and shipped ready for assembly. Molding and fabrication of finished parts, as well as the manufacture of the major part of the resins used, are done in the PANELYTE plant. "Out front" in the war effort, this greatly enlarged plant is now supplying over 2000 parts to the aviation industry alone. In addition, a tremendous volume of PANELYTE mechanical and electrical parts is being used in maritime construction, and for equipment in the Signal Corps and other branches of the service.

4 GIVE TECHNICAL AID...AND ASSIST IN DESIGNING

PANELYTE policy for the past 13 years has been to work in closest cooperation with the engineering staffs of leading firms in the Automotive, Aviation, Central Station, Chemical, Communications, Electrical Equipment, Marine, Transportation, Petroleum, Radio, Refrigeration, Textile and Paper Industries. PANELYTE engineers designed or assisted in the design of many structural parts which are recognized as important advances in the Aviation and Electrical Industries. Our thorough knowledge of the design, manufacture, and use of structural laminated resinous plastics may help you with some immediate problem — or in planning for future production. Samples and factual Data Sheets are available.

*PANELYTE DIVISION, ST. REGIS PAPER COMPANY... AMERICA'S LARGEST PRE-WAR MANUFACTURER OF THERMO-SETTING MOLDED LAMINATED PLASTICS

PANELYTE *the structural plastic*

PANELYTE DIVISION
ST. REGIS PAPER COMPANY
230 PARK AVENUE, NEW YORK

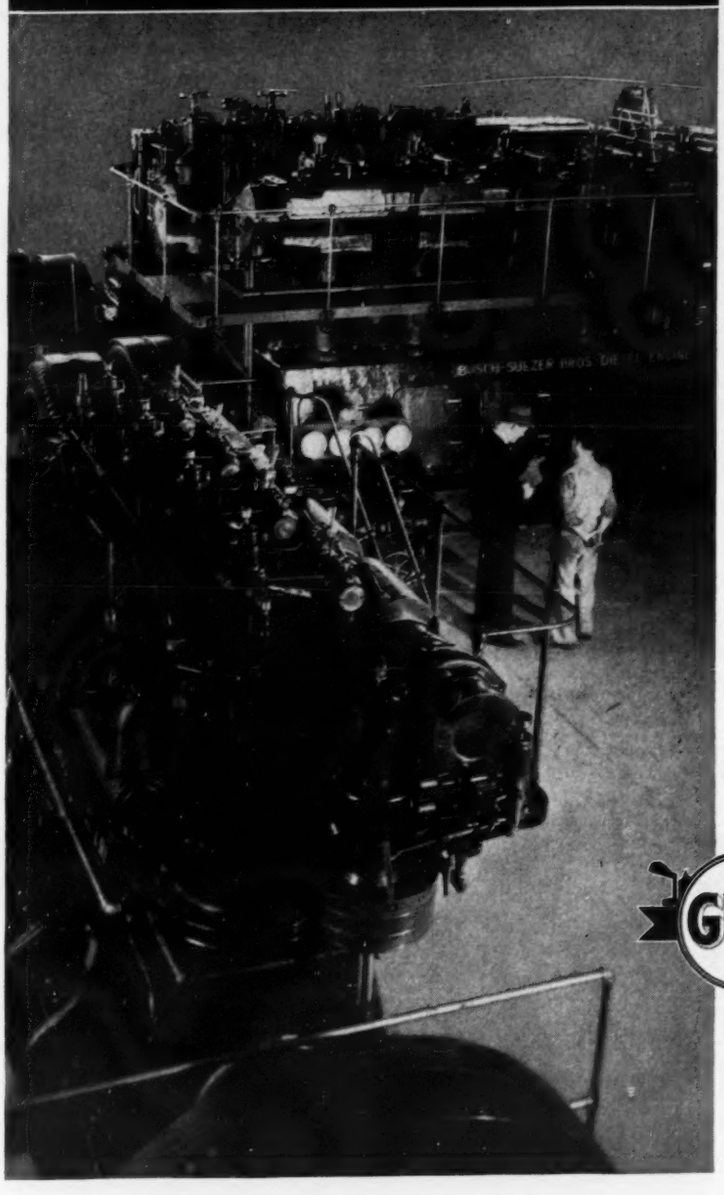
MASS PRODUCTION OF SHEETS, RODS, TUBES, MOLDED FORMS, FABRICATED PARTS

Sales Offices: Atlanta, Chicago, Dallas, Denver, Detroit, Houston, Kansas City, Los Angeles, Montreal, New Orleans, St. Louis, St. Paul, San Francisco, Seattle, Toronto, Vancouver

Experienced and reliable Fabricators in Industrial Centers from coast-to-coast

Gulf Parvis Oils

provide
the greater protection
your Diesels need now!



Wear, repairs, and operating costs go down to rock-bottom levels with these stable lubricating oils in service

Says the Superintendent of a municipal power plant, as noted in Diesel Progress: "We now give lubricants more consideration than formerly since greater demands are placed on the equipment due to increased loads. Units which ordinarily carried normal loads now carry full loads and in some cases overloads thus causing higher operating temperatures."

Hundreds of operators insure greater protection for their Diesels under today's operating conditions by turning the lubricating job over to Gulf Parvis Oils. Especially manufactured for Diesel engine lubrication, these quality oils have greater stability and higher lubricating value—they stand up and provide a tough film that is a constant safeguard against excessive wear, shutdowns, and high maintenance expense.

For full protection and higher operating economy in *your* plant, take this step today. Call in a Gulf Lubrication Service Engineer and ask him to recommend the proper grade of Gulf Parvis Oil to fit your particular requirements. His thorough training and broad experience with all types of Diesel engines is your assurance of sound and helpful recommendations.

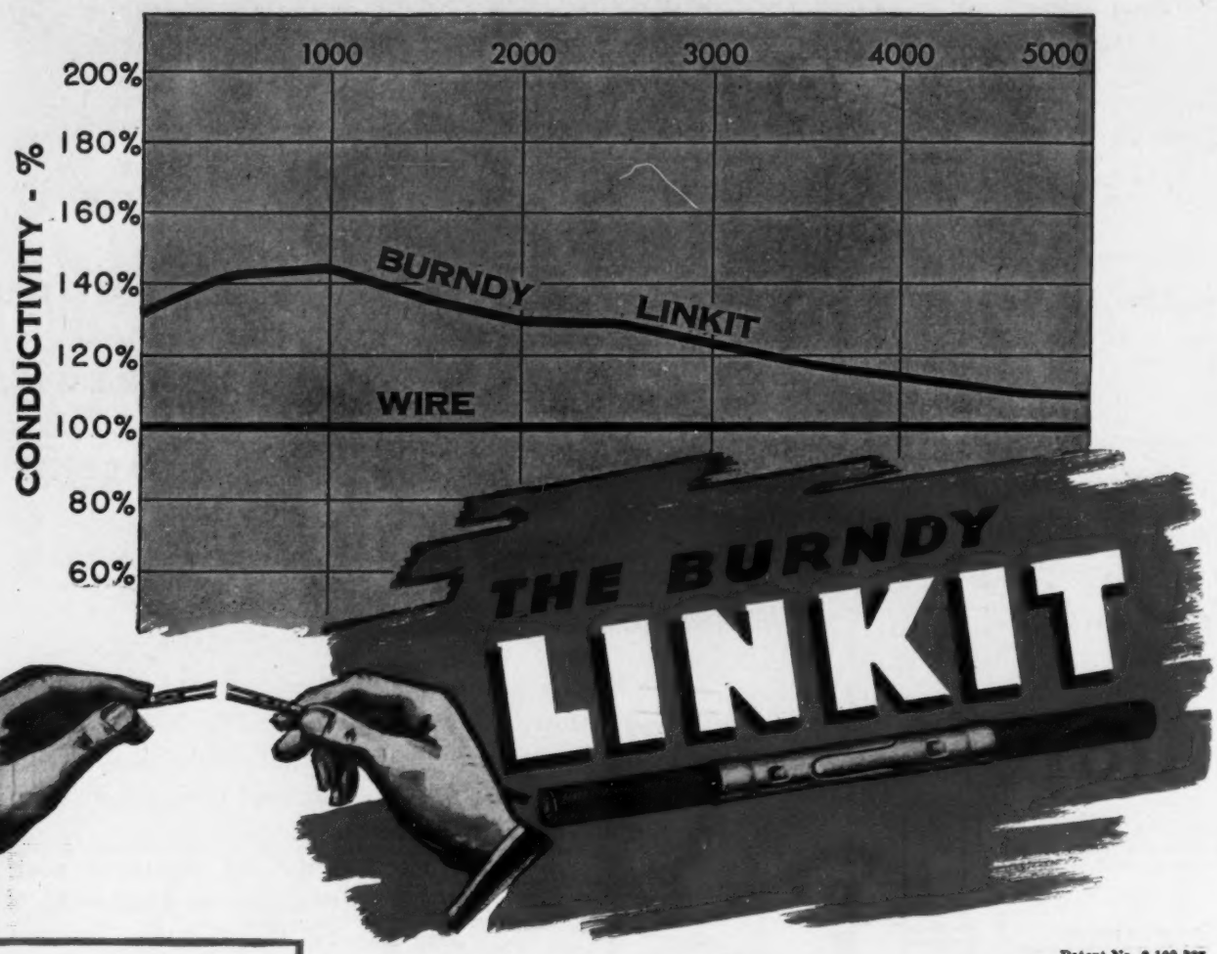
FOR VICTORY BUY UNITED STATES
WAR BONDS AND STAMPS

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
Gulf Building, Pittsburgh, Pa.

After 5000 makes and breaks

RELATIVE WIRE CONDUCTIVITY is still 110%!



Patent No. 2,100,837

THE DETACHABLE CONNECTOR WITH NO LOOSE PARTS!

This is the test that wins *instant approval* for the Burndy LINKIT! For even 100 makes and breaks would be *extreme service* for a small wire connection. Yet the LINKIT withstands *thousands,* with little effect on conductivity . . . proof of the *enduring strength* and *wearability* of its four *long* contact surfaces.

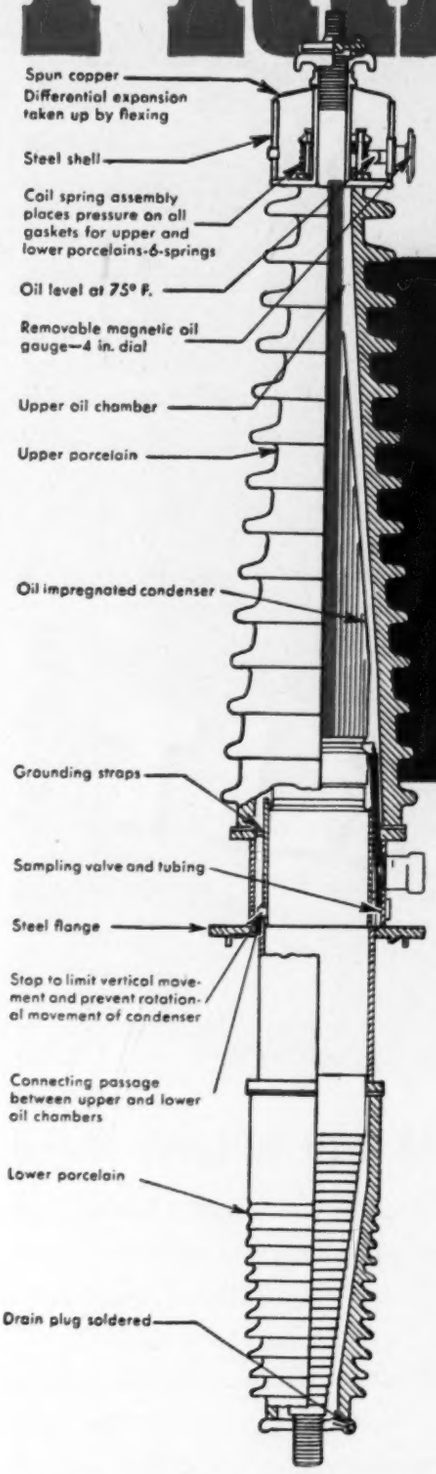
Remember, too, that each half of the LINKIT is identical . . . and there are no extra parts to loosen or lose. The halves are quickly and securely indented to the wires with Burndy HYTOOLS in the usual way. LINKITS and LINKIT lugs are available for all wire sizes from #22 up. Literature gladly sent on request.

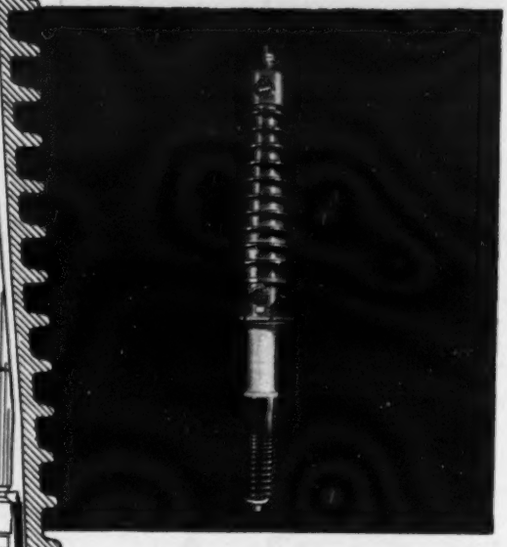
BURNDY ENGINEERING CO., INC., 107 Eastern Blvd., New York 54, N.Y.

BURNDY *Headquarters for Connectors*

PROTECTED

From the inside out


Spun copper
Differential expansion taken up by flexing
Steel shell
Coil spring assembly places pressure on all gaskets for upper and lower porcelains-6-springs
Oil level at 75° F.
Removable magnetic oil gauge—4 in. dial
Upper oil chamber
Upper porcelain
Oil impregnated condenser
Grounding straps
Sampling valve and tubing
Steel flange
Stop to limit vertical movement and prevent rotational movement of condenser
Connecting passage between upper and lower oil chambers
Lower porcelain
Drain plug soldered



THE WESTINGHOUSE OIL-IMPREGNATED CONDENSER BUSHING

You have to look *inside* the Type "O" Condenser Bushing to find the real insulation—*the condenser*. The outside porcelain serves primarily as a weather casing; the oil filling as a secondary sealing agent. But the real job of isolating high voltage from ground is done by the *exclusive* Condenser Insulation.

Just like the leaf springs in your car, this design distributes stresses uniformly. This means long life for the dielectric material, uniform electrical performance, negligible radio interference and minimum size.

As a permanent seal against moisture, all joints of the Type "O" Bushing above oil level are soldered or brazed, while gaskets are used below the oil level. The oil-filled space between the condenser and the porcelain acts as a reservoir insuring that the condenser will always be surrounded with oil and completely impregnated. A magnetic oil gage continuously indicates the level of the oil.

Your Westinghouse representative has further details on the Type "O" Condenser Bushing. Consult him, or write: Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N

J-60

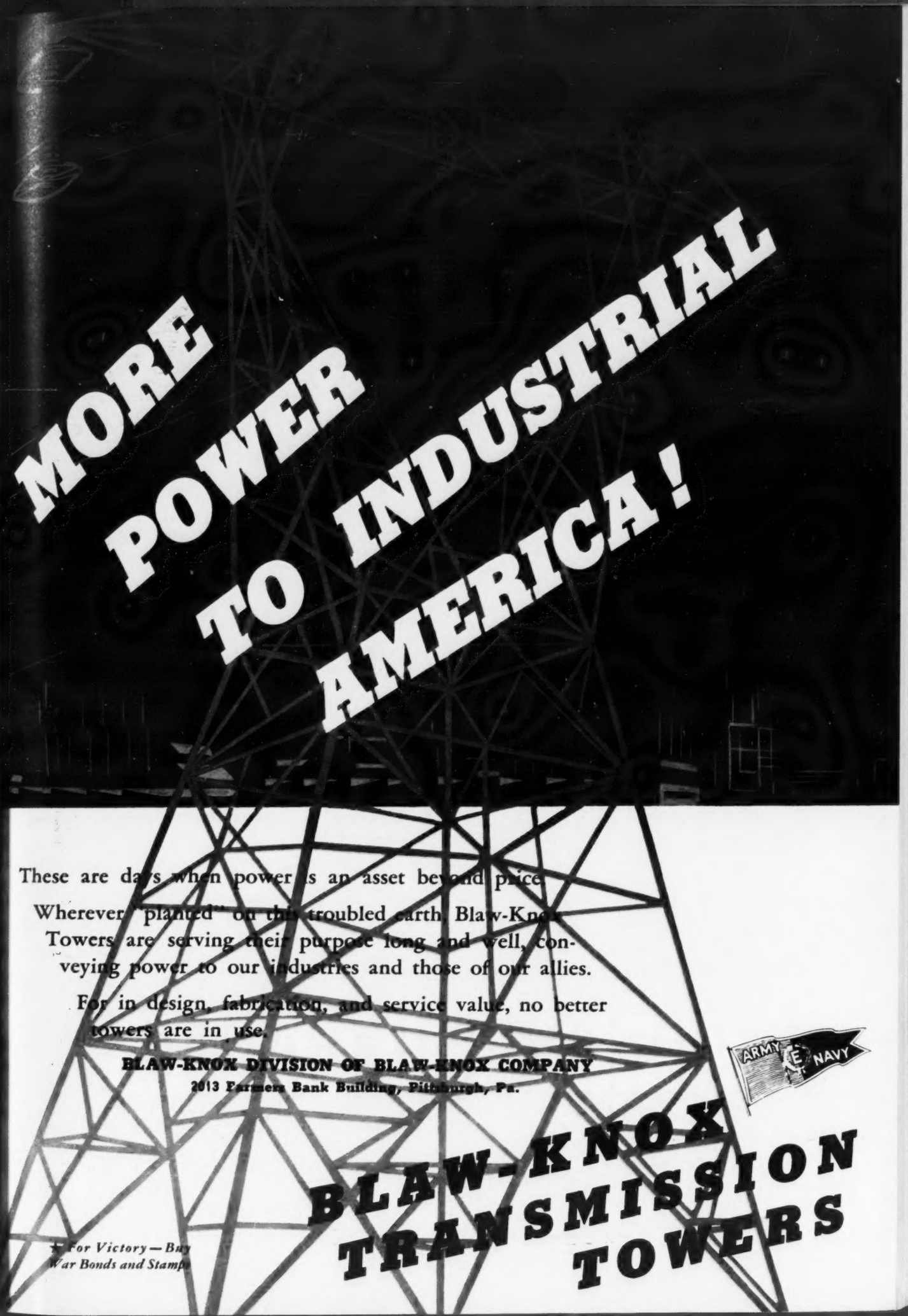
Westinghouse supplies Type "O" Oil-impregnated Condenser Bushings for service voltages from 92 to 230 kv. Type "O" Bushings of the same voltage and current ratings are interchangeable between oil circuit breakers and large power transformers.

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

CONDENSER BUSHINGS



These are days when power is an asset beyond price.

Wherever "planted" on this troubled earth, Blaw-Knox Towers are serving their purpose long and well, conveying power to our industries and those of our allies.

For in design, fabrication, and service value, no better towers are in use.

BLAW-KNOX DIVISION OF BLAW-KNOX COMPANY
2013 Farmers Bank Building, Pittsburgh, Pa.

ARMY E NAVY

BLAW-KNOX TRANSMISSION TOWERS

★ *For Victory—Buy War Bonds and Stamps*

National Electric

PRODUCTS

Sherarduct Conduit · Raceways · Boxes · Fittings

Roughing-In Wiring Systems

RUBBER · SYNTHETIC · VARNISHED CAMBRIC · LEAD · STEEL

WIRES AND CABLES

NATIONAL ELECTRIC PRODUCTS NE WIRING 6 SYSTEMS WIRES AND CABLES

National Electric Products Corporation

Pittsburgh, Pennsylvania

NATIONAL ELECTRIC PRODUCTS NE WIRING 6 SYSTEMS WIRES AND CABLES

Engineering's Place

What part can the engineer play in post-war planning?

There is a certain amount of construction to be done, such as replacing reserve, correcting some emergency practices, and taking up deferred maintenance, all of which will provide a certain amount of additional employment. In a year or two, however, most of this war corrective work will be finished, and then what?

It is highly doubtful if the acute employment problem will come in the period immediately following the war. From all indications the reconversion period will be shorter than the time it took to convert to war production. There will be a feverishness to get back to the old customers, with the possibility that there may even develop another labor prosperity period.

This can be called the period of refilling the pipe line, and after that will come the real test of our planning. Employment depends upon production, and that depends upon sales. Does that mean that planning is solely a matter for sales? If it is so understood, then we may wake up to find that sales can't produce.

To be successful, sales must have the support of engineering. The system-planning program of the past, which did such a splendid job in providing power adequacy for war, is but a part of the planning of the future. Merely to have capacity to serve wherever wanted whenever needed is not going to be enough. Engineering must go much further. It must understand what sales is trying to do and provide the means to accomplish that task. In this joint effort engineering may have to work behind the scenes, while sales stands out by the footlights taking the bow, but the responsibility for a successful performance is there just the same.

Engineering, for instance, must find out from sales how much the customer is willing to pay for any kind of service and then find ways and means whereby this price can be met. It must find new construction and operating methods that will reduce costs and bring lower rates. It must show sales how investment can be more profitably employed.

Under operation as a regulated monopoly, engineering took the position that it must do everything within its power to give the customer as good service as possible. Under the regulated competitive operation of the future engineering can give the customer a service only as good as he is willing to pay for. That doesn't mean that the service will be poor, only that service safety factors must be less idealistic and more realistic.

In other words, in the planning to provide for continuity of employment, engineering has an extremely important part to play. Its efforts, however, must be co-ordinated, as never before, with sales. There can be no question of sales taking what engineering has to offer and doing the best it can to sell it. Instead, engineering must acquire an intimate viewpoint of what the customer wants and will buy and a willingness to help sales in every possible way.

With the knowledge provided by engineering, sales can set a goal—with the support of engineering, sales can reach that goal.

Carrier Control of Sectionalizing Air Breaks

Reduction in interruption duration obtained by controlling spring-actuated air-break switches on 33-kv. tie feeders through dialing of 104-kilocycle carrier

CARL H. FAUST, Philadelphia Electric Company

REMOTE CONTROL of transmission and distribution line switches has become a requisite for the maintenance of a high standard of reliability, especially in these times when storms and other emergencies may cause interruptions to important war industries. The problem of sectionalizing the 33-kv. transmission system of the Philadelphia Electric Company has been partially solved by the installation of carrier-current control for spring-operated air-break switches, located at strategic points. The carrier-current system has been in operation for more than three years and a satisfactory reduction in the length of service interruptions has been experienced where switches are remote controlled.

Suburban Expansion

Suburban territory of the Philadelphia Electric Company, approximately 1,500 square miles in area, is supplied by a 33-kv. transmission network, with substations in the larger towns stepping down the voltage to 4 kv. Many of these substations are unattended. The 33-kv. lines at the substations are controlled by circuit breakers equipped with selective and overload relays, so that in the event of a single failure breakers open and isolate the faulty section without service interruption.

During the past five years a large number of industrial and residential customers moved into the suburban area. The 4-kv. distribution system was unable to carry these loads and unit substations were connected to the sections of 33-kv. lines between substations to supply the 4-kv. distribution concentrated at new locations. Air-break switches were located on each side of the 33-kv. tap to the unit substations. The larger industrial customers (usually above 500 kva. demand) were similarly connected to sections of 33-kv. lines with switches generally on each side of the tap-off.

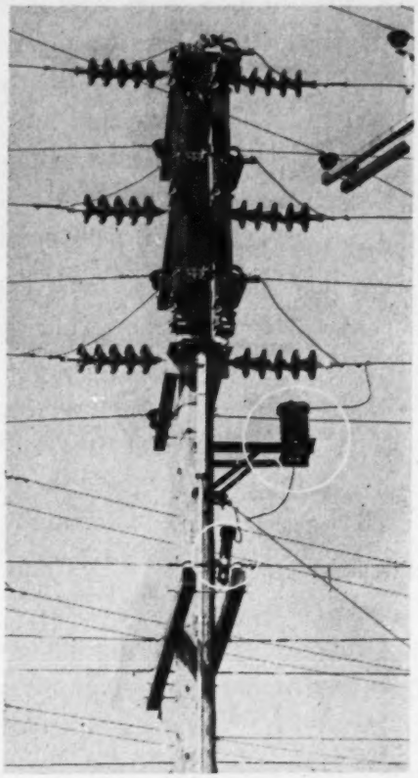


FIG. 1—Vertical pole-top switch, coupling condenser in upper circle and drainage coil in lower circle; the lead to the receiver is shown extending to the right below the condenser

Under these conditions it is obvious that when a failure occurred in a line between substations the supply to unit substations or to high-tension customers in the faulty section was interrupted until men could be dispatched to operate the air-break switches. This meant that a poorer grade of service would result unless operation of switches at important locations by remote control could be effected.

Performance Stipulations

A remote-control system that combined the elements of simplicity and efficiency of operation involved the following considerations:

1. An air-break switch which could be operated without an a.c. supply at the time of operation.
2. A system that did not require the installation of conductors between the control point and the switches.
3. A system capable of operating switches within a radius of 25 miles of the control point.
4. A reliable device for actuating the operating mechanisms of the air-break switches.

Considering the above factors, it was decided to conduct experiments with carrier current.

Tests with carrier current at 100 kc. were made between one conductor and ground, using the 4-kv. distribution system (which is three-phase-Y with grounded neutral) as the conducting path for the signal. A workable signal was received within a radius of 5 to 6 miles of the transmitter. However, due to the absorption of the primary system, the signal strength dropped off very rapidly beyond this point. This characteristic

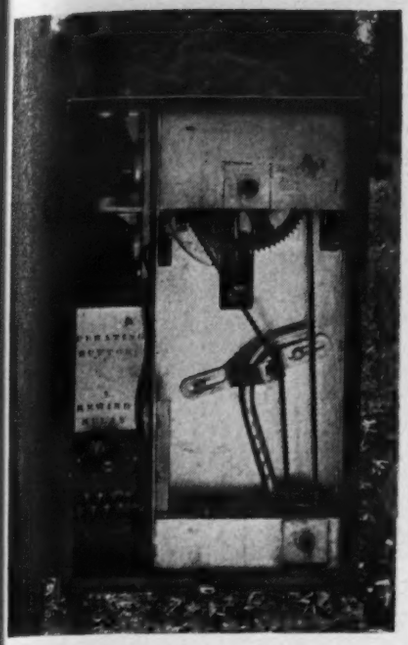


FIG. 2—Rewind side of air-break switch-operating mechanism
Motor is located in the lower left corner and drives the large geared wheel in the upper part of the compartment through a series of gears. In back of this wheel is a cam which engages the yoke at the upper end of the springs shown in Fig. 3 and puts them in tension. Control buttons shown are to operate and rewind switch in the field.

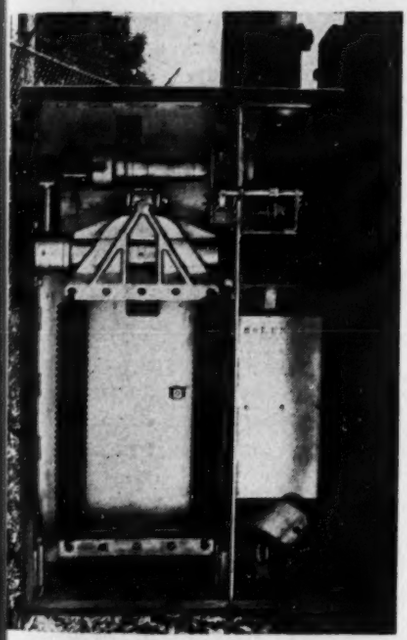


FIG. 3—Spring side of the air-break switch-operating mechanism
The operating shaft extending through the top of the compartment at the right is driven through a set of beveled gears by a spindle which is actuated by a toothed segment attached to the yoke shown above the top of the springs; there is a clutch arrangement which disengages for the re-winding operation.

did not change appreciably with an increase in power at the transmitter.

Tests were then made on the 33-kv. network because this was the only metallic circuit between all switches to be operated and the control point. The 33-kv. network was supplied with signal from a reasonably large transmitter and the signal was received at practically every point tested. The signal strength varied at different locations, but a strong signal was received at every location where switches were to be operated. This indicated that the 33-kv. lines were the logical path for the carrier-current signal.

Cam Switch Devised

A vertical pole-top 33-kv. air switch was designed by G. S. Van Antwerp, general superintendent of the transmission and distribution department. Switch is actuated by a cam on the upper end of the operating shaft; the first half revolution of the shaft opens the switch and the next half revolution in the same direction closes the switch. The switch is operated by a mechanism containing four large coil springs; the springs are put in tension by a small motor through the use of reduction gears. With the energy stored in the springs it is possible to operate the switch three times during an interruption of power to the equipment.

A 1-kw. transmitter tuned to 104 kc. was installed at a generating station, connected through condensers to the 33-kv. bus with a drainage coil between the low-voltage side of the condenser and the ground. Eleven receivers, together with fifty-point selector switches and associated relays, were installed at different locations to operate 21 switches. Each switch is identified by a three or four digit number.

Operating Technique

In practice, the station operator is instructed by the load dispatcher to operate a certain switch. The number of the switch to be operated is dialed on an ordinary telephone dial. Two annunciators, operated by separate receivers, permit a visual check by both the station operator and the load dispatcher of the number dialed. The transmitter switch is then opened, taking the carrier current off the system and operating the switch which has been dialed. All switches may be rewound by dialing a rewind symbol, provided service to the rewind motor has been restored.

A number of difficulties were experienced in the development, installation and operation of the system. Although the receivers were designed to operate on a 10-volt signal, and the average voltage at the receivers under the normal network arrangement was 45 volts, much lower voltages were experienced when certain lines were out. A tuning unit was installed ahead of the receivers which increased the average voltage to 125 volts.

While there is very little cable on the 33-kv. system, it was found necessary in one case to install blocking

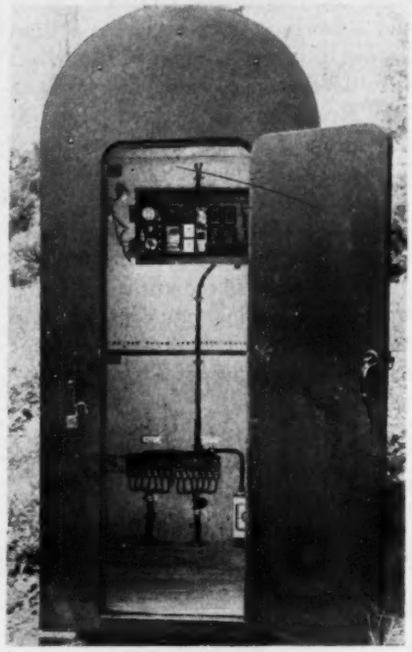


FIG. 4—Receiver, selector switch, relays and auxiliary switches in a wood housing

chokes adjacent to the cable to prevent absorption of the signal.

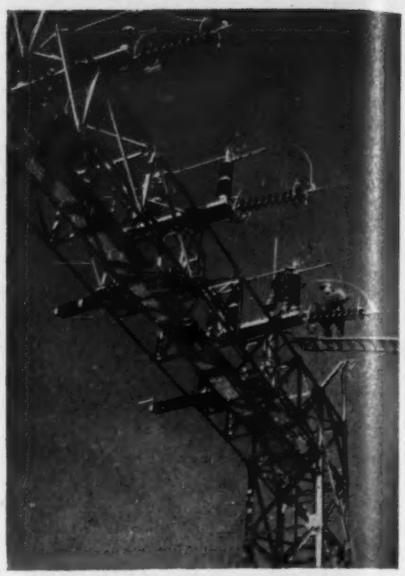
A trolley line parallels one of the 33-kv. feeders for 18 miles. While normally this does not affect the carrier current, a defective car set up a signal which was interrupted the proper number of times to operate one of the switches. A blocking circuit was designed which made the receiver inoperative to a foreign signal.

The carrier-current equipment, including transmitters, receivers and auxiliary control devices, was designed, developed and built by employees of the Philadelphia Electric Company.

110-Kv. Tie Line Uses Progressive Design

Wooden H-frames, flying ground taps and counterpoise provide high-level lightning protection in 10.7-mile run

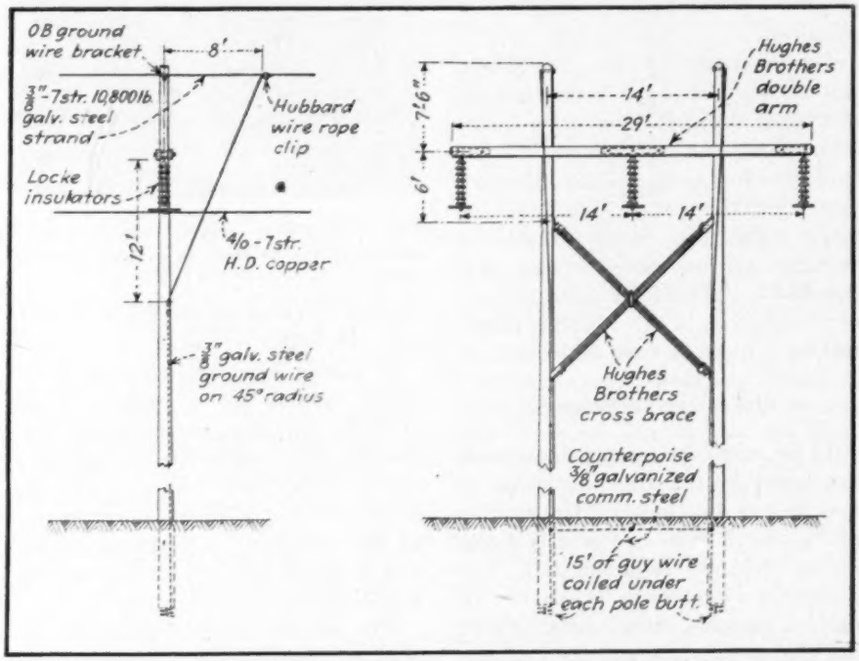
E. A. CHURCH and E. G. STEBBINS, Boston Edison Company



CONNECTING phase wire loops to post-type insulators at substation terminus

TO SAVE STEEL by eliminating towers and metal crossarms in the recent construction of a 110-kv., 10.7-mile suburban transmission tie line Boston Edison Company used an H-frame design to great advantage. Line location was derived from a Fairchild aerial survey with a camera having a 12-in. lens, the scale being 1 in. to 800 ft., with exposures at 9,600 ft. above ground. Individual shots overlapped 60 deg. longitudinally, so that stereoscopic viewing could be had. The actual layout was made on a mosaic map or composite print of the original negatives enlarged to a scale of 1 in. to 400 ft.

It was decided to build an X-braced line using double plank crossarms with wooden filler blocks. In conjunction with Hughes Bros., Seward, Neb., who provided the crossarms, X-braces, wooden strain insulators and certain smaller items, a satisfactory design was prepared. In this line are 102 tangent type structures, 24 highway crossing structures of modified tangent type, 17 30-deg. or medium-angle structures and four heavy angle frames of the three-pole type. All crossarms, X-braces and wood strain insulators are of air-dried Western fir treated with a non-toxic light mineral oil.



IN TYPICAL H-frame tangent structure a 13-ft. wood path is provided between the suspension point of the insulator string and the overhead ground wire bracket. On highway crossings the arm is 6 ft. longer to care for dead-end tees. Back guys only were used on this type of structure

Basic pole height for the optimum span length with 25-ft. ground clearance at 60 F. was 55 ft. The highest poles on the line were 65 ft. long, used mainly at highway crossings where 15-ft. clearance was required between conductors and distribution lines. Creosoted Southern yellow pine poles were used. On ordering, No. 2's were specified, as the filler blocks on the double plank arms were designed for this size. Both vendors stated that the poles would probably run a little large, but we were surprised to receive No. 2 poles with poles having 12 to 14 in. tops instead of the regular 7 to 8 in. diameters. This required some trimming of the tops in order to slide the crossarms into position.

The insulators were of the heavy-duty ball-and-socket type with a grading ring at the conductor end only. Eight disks are used in suspension and nine in dead-end strings. Copper shields were used under all the clamps.

The power conductors are of No. 4/0, 7-strand hard-drawn bare copper wire spaced 14 ft. apart on centers, strung to an ultimate tension of 4,000 lb. and spliced by Anaconda drawn seamless connectors. We had hoped to get this wire on 3,500-ft. reels, but received 2,500-ft. reels because of copper industry conditions. There are two overhead $\frac{3}{8}$-in., 10,800-lb. Bethanized steel ground wires connected to a counterpoise at each structure by flying taps.

We did not use the metal gap between top insulator hardware and ground connection to protect crossarms against splitting under lightning voltages on this line. Such applications are set in typical cases for a lower flashover voltage than the wood across which the gap is placed. We believed that the wood would protect itself against all but the most severe surges if there was enough of it in series with the insulators. Where this is the case the insulation level of the line is increased and the number of flashovers thereby decreased.

To obtain enough wood in series without excessive crossarm length the ground connection was attached to the ground wire 8 ft. out from the pole and attached to the pole at least as far below the crossarm as the ground wire is above the latter. The New England Power System originated this method on its "pole-arm" lines. In this work the impulse strength of wood and insulators should be approximately equal to that of the air gap between the arcing rings and the ground connections. No gain results from exceeding this. With the ring dimensions and placement of ground connections used, the gap distance is 7 ft. at 0 deg. swing of the insulator string from the vertical, equivalent to 1,250-kv. gap strength, and 6 ft. at 15 deg. swing, equivalent to 1,050 kv. gap strength.

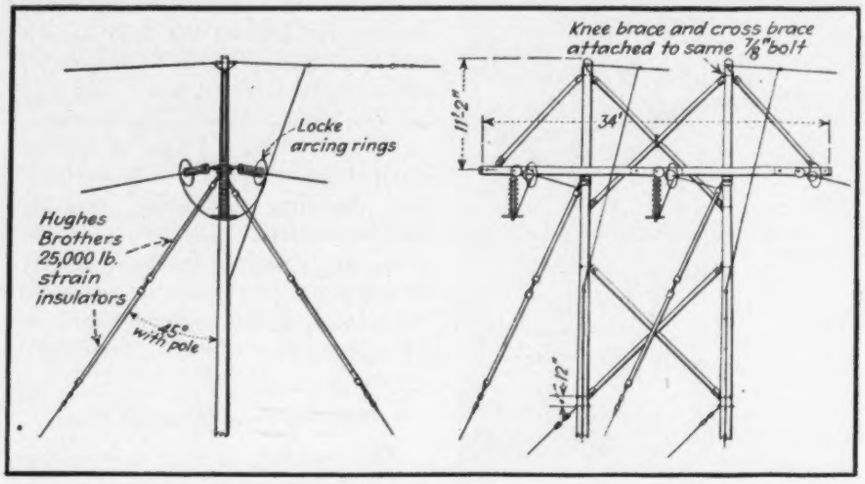
Ground Wire Location

Position of ground wires relative to the conductors has a marked effect on shielding against direct strokes. Latest available data indicate that an angle of not over 15 deg. is desirable between the ground wire conductor and a vertical plane through the power conductor. It was impossible to obtain the required height of ground wire above power conductors on this line to give such a maximum angle without bracing the pole tops at every structure. This was not considered worth the cost, since the conductors are shielded for the great majority of strokes for angles considerably above 30 deg.

The angle obtained at all suspension structures was about 35 deg., and much less than this at midspan due to the greater tension of the ground wires compared with the conductors. Normal span on this line is 400 ft. This greater tension also gives more clearance between ground wires and power conductors at midspan. It has been shown that too much clearance cannot be obtained at midspan since the electrical distance to ground for the passage of lightning surges is so much greater than that at the pole top, allowing much higher voltages to be built up at midspan. At dead-end structures where power conductors are attached on the crossarm level the poles were extended 4 ft. higher and braced to obtain the required clearance and the minimum of 13 ft. of wood.

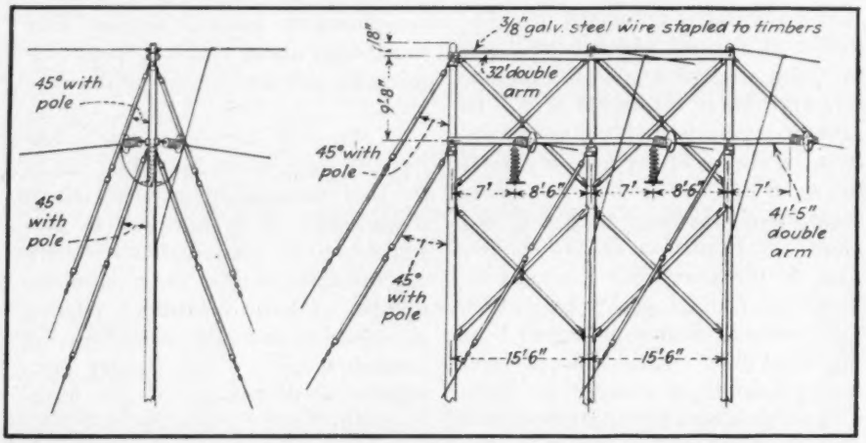
Guy insulators were provided to protect animals from lightning voltages. Due to the high insulation level of the line and the inability of obtaining in all structures sufficient clearance between power conductors and guys, two 12-ft. guy insulators were required on some dead-end structures. The line insulation level also made it necessary to provide extra clearance between conductors and other lower voltage lines or telephone wires. A minimum clearance of 15 ft. was specified between power wires and all other conductors or foreign structures.

Further to increase lightning protection a continuous $\frac{3}{8}$-in. galvanized steel counterpoise was buried in the ground 12 to 30 in. deep. Nearly all



DETAILS of medium-angle (30-deg.max.) structure.

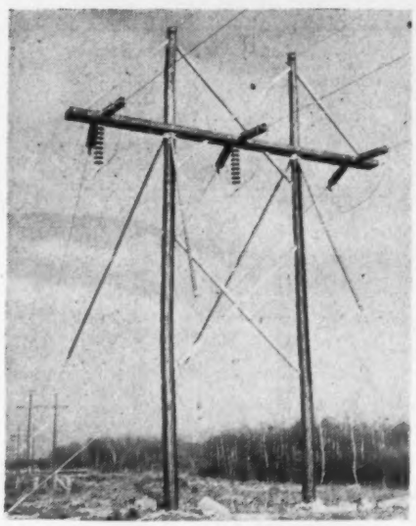
Two sets of cross braces were used, with knee braces to stiffen the unguyed pole tops above the crossarms. Side guy is placed low just under cross braces. Each insulator has 12 ft. of clear wood between metal and fastenings and must clear the ground wire flying tap by 1 ft. minimum and be at least 4 ft. from the power conductor. On lesser angles this threw the head guys out of line with the power conductors, so that they act somewhat as side guys. All guys in the high-voltage area have two strain insulators in series.



DEAD-END and heavy-angle (54 deg.max.) H-frame. Due to the 41-ft. crossarms these are spliced on the center pole. A $\frac{3}{8}$-in. steel ground wire runs along the top timbers, with connection to each overhead ground wire for lightning protection.

this counterpoise is effective in reducing footing resistance. It was laid by a Killefer plow except at finished highways, where an iron pipe was driven under the surface and the wire threaded through. Some lines have had the two ground wires connected together at the pole tops, which has some advantages where tower footing resistances are high. Calculations showed in our case that with the lower resistances obtained with the use of the counterpoise the advantage gained by tying across the H-frame top was negligible, so it was not done on this line.

Guys are all $\frac{7}{16}$-in., 14,500-lb. galvanized steel wire attached to the



TYPICAL dead-end and medium angle H-frame structure with tangent line behind

poles with bands, except that side guys on medium-angle structures are provided with malleable iron guy hooks.

The new line is connected to a substation at one end which is tied into overhead steel tower circuits of considerably lower insulation level. To prevent extremely high voltage surges from coming into the substation off the wood line and flashing insulators there, or on the lines supplying this point, the insulation on the connections to the wood pole line was reduced to 7 disks per string, which will flash over at that point and clear the wood line. While this increases the probability of outages for lightning strokes near the substation, it is anticipated that it will not appreciably affect the record for the whole line.

Electro-Agricultural Definitions Needed

M. M. SAMUELS,* Rural Electrification Administration

A NEW INDUSTRY is in the making, christened by the present author as "Electro-Agricultural Industry."† American manufacturers are in the process of spending considerable sums of money on the development of new equipment that the electrified farm can use for farming itself. It goes far beyond the field known as "domestic appliances." It includes dehydrators, freezers, flour mills, egg coolers, potato coolers, pasteurizers, the great unexplored field of electric sterilization including soil sterilization, handling equipment, possibly electric tractors.

All are designed for high quality and quantity production by reputable manufacturers and made available to the American farmer at reasonable prices.

Emerging from Amateur Stage

This industry is even now emerging from the amateur stage, as was indicated recently when the War Production Board issued priorities to manufacturers for the immediate production of 100,000 small electric dehydrators for home use. The American manufacturers were ready to undertake at once the quantity production of an article that they never manufactured before, because they had looked ahead and had spent considerable time and money on development.

In the early days of a new industry it is particularly important not to let over-standardization bring about stagnation. It is necessary to give free rein to the imagination of American inventive genius. But a minimum number of basic definitions relating to capacity and test procedure are needed at once. This relates principally to definitions of the terms "capacity" and "efficiency."

For instance, in the case of the domestic dehydrator the trade speaks of capacity in terms of pounds of apples, while others use carrots as a basis. This, of course, cannot be termed an engineering definition of capacity. In addition to the establishment of a basic material as a criterion, the time element and the ambient conditions should be considered in the term "capacity." The same difficulty prevails relating to "efficiency." The trade speaks of so many kilowatt-hours per pound of dried apples or dried carrots, evidently a very ambiguous definition from an engineering viewpoint.

Likewise, in relation to freezers, the trade speaks of a "15-cu.ft. freezer" or a "20-cu.ft. freezer" in order to indicate capacity. There, too, the time element and the ambient conditions would have to be included in the definition of capacity. The efficiency in this case is even more difficult to express.

No Damper on Progress

The establishment of some definiteness in relation to these definitions would in no way interfere with the free play of the inventors' and developers' imagination and would in no way hamper progress, but it would establish a foundation for business transactions, remove doubts from the mind of the prospective buyer and prevent to a great extent the appearance of junky imitations on the market.

Anyone who knows the history of engineering definitions will at once realize that what is proposed here is a very difficult job. But just because it is difficult a beginning should be made at once. Both A.I.E.E. and N.E.M.A. should at once establish working committees to study the subject and solicit the co-operation of those who have been active in stimulating creation of this new industry.

*Chief, Technical Standards Division.

†See "Electrical Engineering," October, 1942, page 517.

St. Louis Sets Pattern for Implementing L-94

In compliance with WPB Limitation Order L-94 the Union Electric Company has set up detailed plans and records to smooth the rocky road to rationing should a power shortage develop in the area to threaten the war effort

PLANS that have been laid on the Union Electric System for implementing Limitation Order L-94 are seen by recognized authorities as a model for completing the steps from early emergency curtailment of power to full formal rationing contemplated under this now famous "power shortage" order.

It should be stated plainly at the outset, however, that there is no power shortage at present in the St. Louis area, nor is there any immediate threat of one in the opinion of those who should know. The simple fact is that under WPB order L-94 all electric utilities are asked to prepare plans for rationing power effectively should a shortage develop during the war period. This article describes one such well-considered plan.

Keystone of the St. Louis plan was laid many months before the order was written. Records assembled then, when the company was gathering data and organizing its resources for war,

POWER SURVEY

Covering All Large Customers of Union Electric System

Basic Month November 1941

Name John Doe Mfg. Co. Date January 26 1942

Address 3740 Avenue B Type of Business Manufacturer of

City St. Louis automobile maintenance supplies ordnance supplies—tools & dies

I. PRODUCTS AND PERCENTAGE OF EACH USED FOR DEFENSE:

Automotive maintenance equipment	50%
Ordnance supplies	100%
Tools and dies	100%

II. VOLUME OF DEFENSE BUSINESS AND POWER USED THEREFOR DURING November 1941

(Explain answers fully under "Remarks")	PERCENT OF TOTAL KWHRS	PERCENT OF TOTAL BUSINESS
Prime Defense Supplies	59.7	60
Other Defense Supplies	21.8	20
Total for Defense	80.1	80
Other Essential Services	0.0	0

III. POWER CONSUMPTION DATA (Explain answers fully under "Remarks")

	ACTUAL November 1941		ESTIMATED FOR FUTURE June 1942	
	Kw Demand	Kwhrs Per Mo.	Kw Demand	Kwhrs Per Mo.
Used for Prime Defense Supplies	356	66,300	451	121,500
Used for Other Defense Supplies	40	24,500	40	30,000
Total for Defense (*)	396	90,800	471	151,500
Used for Other Essential Services	0	0	0	0
Used for All Other Purposes	292	22,700	292	10,000
Total Power Purchased	596	113,500	471	161,500

(*) Operation of departments so integrated that it is not possible to segregate demands.

IV. OPERATING DATA

	ACTUAL November 1941	ESTIMATED FOR FUTURE April 1942
Hours Operated per Day	Ordnance —22.5 Auto Mtce Eq.—8.0	22.5
Number of Shifts per Day	Ordnance — 3 Auto Mtce Eq.— 1	3
Number of Days Operated per Week	Ordnance — 7 Auto Mtce Eq.— 5½	7

V. POWER CONSUMING DEVICES	CONN. LOAD KW	MAX. DEMAND KW	DEMAND DURING CUST. PEAK KW	SCHEDULE OF OPERATION: HRS PER DAY	DAYS PER WEEK	DAYS PER MO.	WKS PER YEAR
General Lighting	157	100	76	18	6	26	12
Display & Sign Lighting	0	0	0	0	0	0	0
Commercial Cooking	0	0	0	0	0	0	0
Refrig., Air Cond., Ventilation	0	0	0	0	0	0	0
Resistance Welders Rated 225 kva.	115	15	15	22	6	25	12
Electric Heating Load	75	61	46	22	6	25	12
Other Power Loads: (See detailed list attached)							
Ordnance Dept	71.2	45	40	22	7	30	12
Machine Shop	215	125	115	20	6	26	12
Tool and Die Dept.	45.5	25	20	22	7	30	12
Air Compressors	48.8	25	20	22	7	30	12
Miscellaneous Equip.	241.1	120	65	16	6	25	12
TOTALS	942.4	516	396				

REMARKS:

Include here the following information. (1) Supporting data for Items II and III. (2) Effect of priorities situation on customer's future operations and power requirements. (3) Any economies in power consumption which customer can achieve. (4) All other pertinent facts.

We have read the within information and believe it represents our correct situation at this time. Should material changes develop in the future, we will promptly notify Union Electric Company

By J. Blowe President (Title)

Interviewed by: Richard Roe

FIG. 1—**POWER SURVEY FORM** filled out and signed by all customers with demand of 50 kw. or over provided the basic data on wartime power needs of major customers

now form the heart and core of the plan. Around these records has been woven a scheme of operations that will contribute to the step-by-step, orderly apportioning of power sought by the authors of L-94.

In the event of an emergency L-94 contemplates in general that:

1. Emergency curtailment schedules will be set up should there be a failure of generating units, transmission lines or other equipment; these emergency measures to stay in effect until the machinery of formal rationing is started.

2. Formal restrictions will be set upon use of power for purposes defined in Schedule A and upon the amounts of power that can be delivered to customers not exempted under Schedule B.

3. Complete and accurate records of power deliveries to customers will be available.

4. Non-utility electric generating facilities will be operated in parallel with the utility system and to the extent necessary to relieve the power shortage.

Emergency Curtailment Schedule

The emergency curtailment schedule set up for the Union Electric System under paragraph (C) (ii) of the order is essentially an emergency switching plan. It is aimed at meeting operating emergencies from the most logical approach, recognizing the essentiality of certain classes of load where life, public welfare and property damage are at stake. Basically it calls for relieving the system of successive blocks of load—during emergencies—in steps of 25,000 kw. each up to a total of 125,000 kw.

Each successive 25,000-kw. block of load to be released under these conditions will affect increasingly important services. However, the first three blocks of 25,000 kw. are confined to industrial loads or customers who will be least affected by shutdown, from the standpoint of safety, damage to equipment, speed of restoration of service, etc. Probability of ever having to drop more than this amount in any emergency short of a major catastrophe is viewed as extremely unlikely.

Releasing of residential feeders—early considered in organizing the emergency switching plan—was abandoned. Load on these feeders was not big enough to provide "load relief" of any consequence in an emergency. It was found that the 25,000-kw. blocks of load to be released were best and most effectively secured by curtailing customers with demand of 50 kw. or more. This group aggregates less than one-quarter of 1 percent of all system customers, but it accounts for around 70 percent of the total kilowatt-hour sales to ultimate customers.

As a basis for the emergency curtailment plan specified under L-94, therefore, all customers with demands of 50 kw. or over, and in addition, regardless of demand, all hospitals, public water works, radio stations, telephone stations, gas companies and newspapers, have been classified into four groups:

Class 1.—Customers whose operation is considered essential for the public welfare. In this class will fall hospitals, public water works, radio stations, telephone stations, gas companies, newspapers, etc.

Class 2—Customers who require notice before load can be reduced or disconnected. This class includes industrial customers whose operations are such that if disconnected without advance notice hazards or extensive damage to equipment would result sufficient to render the plant incapable of resuming production within a reasonable time after power is restored.

2(a) Customers that can be completely shut down after advance notice.

2(b) Customers that can reduce demand after notice.

Class 3—Customers who can be disconnected immediately, but who must be reconnected at full or reduced load after two or three hours. This class consists of residential and small commercial customers together with those larger commercial and industrial customers for whom a two- or three-hour outage would not be extremely serious but who must be reconnected at full or partial load after that time.

Class 4—Customers who can be disconnected without notice for an indeterminate period.

Feeder Classification

Each feeder circuit is given the same classification as the highest class customer on the circuit. All feeder panels have been marked with the feeder classification and a complete "emergency switching plan" developed.

Exact procedure followed and extent to which the plan is put into effect depend on the system circumstances at the time L-94 is invoked, *i.e.*, amount of power load to be rereleased, location of the available power, load lost when the emergency arises and the forewarning, if any, that is given. In case of a power shortage the dispatcher will follow the emergency switching plan as a guide.

This emergency switching plan provides for the following general steps at attended and unattended substations:

Attended Substations:

1. Release class 4 feeder loads.
2. Release class 3 feeder loads.
3. Release street railway load for a maximum of 15 minutes.
4. Meanwhile inspectors will be dispatched to unattended substations.
5. Strip class 4 customers from class 1, 2 and 3 feeders.

Unattended Substations:

1. Release class 4 feeder loads.
2. Release class 3 feeder loads.
3. Strip class 4 customers from class 1, 2 and 3 feeders.

General:

1. Sales department will contact major class 3 customers, if affected, and explain the situation. If necessary they will notify 2(a) customers of impending outage; class 2(b) to reduce load to predetermined value.

2. Send out radio and advertising appeals to residential and small commercial customers asking them to curtail use to a minimum.

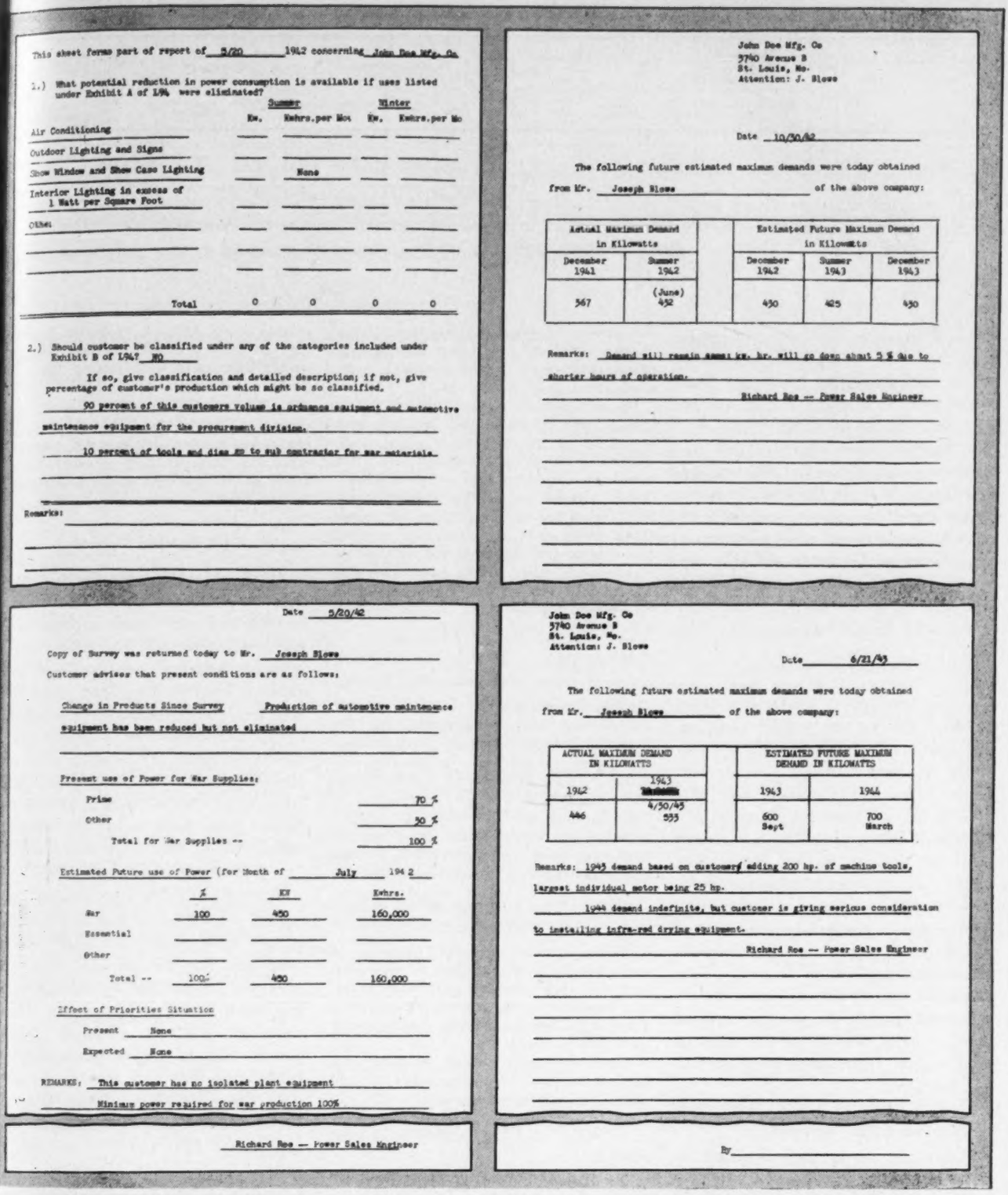
Interim Plan

Inevitably some essential war loads will be cut off in executing the emergency switching plan. This is expected. In the first stages of the emergency protection of life and public welfare must dominate all action. However, war loads must not remain off longer than absolutely necessary—certainly not as long as it will take to swing over to formal power rationing under L-94. That might take as long as a week or ten days, even with the volume of information available for immediate use.

Some interim plan, midway between emergency curtailment and power rationing, is therefore necessary to get war plants back into production. To achieve this on the Union Electric System the Office of War Utilities has directed that plants be restored to production by curtailing power to industries which it feels are less essential to the war effort.

The Office of War Utilities has been furnished a list from which it has selected customers with demands of 300 kw. and over whose operations permit them to be disconnected during this interim period without prejudice to the war effort or to essential civilian services. Load relief obtained in this way will be used to put essential war plants back on the lines.

Working from this "non-essential"



This sheet forms part of report of 5/20 1942 concerning John Doe Mfg. Co.

1.) What potential reduction in power consumption is available if uses listed under Exhibit A of L-94 were eliminated?

	Summer Kw.	Summer Kwhrs. per Mo	Winter Kw.	Winter Kwhrs. per Mo
Air Conditioning				
Outdoor Lighting and Signs				
Show Window and Show Case Lighting		None		
Interior Lighting in excess of 1 Watt per Square Foot				
Other				
Total	0	0	0	0

2.) Should customer be classified under any of the categories included under Exhibit B of L-94? NO

If so, give classification and detailed description; if not, give percentage of customer's production which might be so classified.

90 percent of this customers volume is ordnance equipment and automotive maintenance equipment for the procurement division.

10 percent of tools and dies #D to sub contractor for war materials.

Remarks:

John Doe Mfg. Co
3740 Avenue B
St. Louis, Mo.
Attention: J. Blows

Date 10/30/42

The following future estimated maximum demands were today obtained from Mr. Joseph Blows of the above company:

Actual Maximum Demand in Kilowatts			Estimated Future Maximum Demand in Kilowatts		
December 1941	Summer 1942		December 1942	Summer 1943	December 1943
367	(June) 452		430	425	430

Remarks: Demand will remain about kw. hr. will go down about 5 % due to shorter hours of operation.

Richard Roe -- Power Sales Engineer

Date 5/20/42

Copy of Survey was returned today to Mr. Joseph Blows

Customer advises that present conditions are as follows:

Change in Products Since Survey Production of automotive maintenance equipment has been reduced but not eliminated

Present use of Power for War Supplies:

Prime	70 %
Other	30 %
Total for War Supplies --	100 %

Estimated Future use of Power (for Month of July 1942)

	%	KW	Kwhrs.
War	100	450	160,000
Essential			
Other			
Total --	100	450	160,000

Effect of Priorities Situation

Present None

Expected None

REMARKS: This customer has no isolated plant equipment

Minimum power required for war production 100%

Richard Roe -- Power Sales Engineer

John Doe Mfg. Co
3740 Avenue B
St. Louis, Mo.
Attention: J. Blows

Date 6/21/43

The following future estimated maximum demands were today obtained from Mr. Joseph Blows of the above company:

ACTUAL MAXIMUM DEMAND IN KILOWATTS			ESTIMATED FUTURE MAXIMUM DEMAND IN KILOWATTS	
1942	1943		1943	1944
446	4/30/43 555		600 Sept	700 March

Remarks: 1943 demand based on customer's adding 200 hp. of machine tools, largest individual motor being 25 hp.

1944 demand indefinite, but customer is giving serious consideration to installing infra-red drying equipment.

Richard Roe -- Power Sales Engineer

By

FIG. 2—**SUPPLEMENTARY SURVEY FORMS bring the early survey data up to date from time to time as war plants grow**

plant list OWU subsequently developed eleven classifications of non-essential industries. Plants in these categories having more than 50 kw. demand will be cut off to release still more capacity if needed for operation of other essential war plants.

When L-94 was issued in May, 1942, the Union Electric System already had a complete record system set up in substantially the form necessary to execute the more formal long-time allocation of power contemplated in L-94.

These records had their beginning in September, 1941, in an "office survey" of customers having more than 50 kw. demand. This early survey sought to judge the capacity of individual industrial plants for expanding; to predict the load increase that might develop and find out how much of the present and predicted required needs were for war and essential serv-

	ANNUAL USAGE 1941		USAGE MAY 1941		MAY 1942 USAGE									PRESENT MINIMUM USAGE FOR WAR SUPPLIES			
					TOTAL		WAR SUPPLIES (A-10 or Better)			ESSENTIAL							
	Max. Dem. Kw.	Energy M-KWHrs.	Max. Dem. Kw.	Energy M-KWHrs.	Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.	Pre on
John Doe Mfg. Co.	367	875	315	65	415	152	100	415	152	0	0	0	100	415	152	—

FIG. 3—MASTER CONTROL SHEET condenses the most vital data for each "50-kw." custom

ices. With these facts known steps could be taken to supply all necessary power and minimize hardships that could develop in supplying power to war plants under *all* conditions.

It promptly developed that the information sought was too detailed for an office survey. In the end it had to be gathered by power salesmen in personal conference with customers' officials, using the illustrated (Fig. 1) survey form. This form was filled out in duplicate and signed by the customer, with whom one copy was left.

Customer Survey

Using November, 1941, as a "base month," the survey sought data on five subjects relating to the power needs of each "50-kw." customer. These were: (1) Products and percentage of each used for defense; (2) volume of defense business and power used for defense during November, 1941; (3) power consumption data, present and estimated future; (4) plant operating schedule, present and estimated future; and (5) power-consuming devices.

Usefulness of this information in implementing L-94 can be judged from a brief review of the type of data sought from each so-called 50-kw. customer.

Item I—Products and percentage of each used for "defense":

Object here was to determine exact nature of each firm's products and the extent to which they were used in the war effort. For such generic classes of products as "transformers," "men's shoes," etc., the percent of output absorbed for "defense" was sought. Intent was to determine to what extent customers were "defense industries."

Item II—Volume of defense business and power used for "defense" during November, 1941:

Sought here was the percent of customer's total kilowatt-hour use and likewise the percent of total business for "prime defense supplies," (*) "other defense supplies" (†) and "other essential services" (‡).

Where this information was not available, it was estimated with the help and agreement of the customer.

Proportions of total business and total kilowatt-hours attributed to "defense," "other defense" and "other essential services" need not necessarily be the same. Often power used in making one product varies from that required for another of equal value, made in the same plant. If one is sold for "defense" and the other for civilian purposes, the two percentages will obviously *not* be identical.

Item III — Power consumption data; present and estimated future:

Each customer's actual kilowatt demand and kilowatt-hour consumption for the basic month of November were broken down into that used for "prime defense," "other defense," "essential services" and "all other purposes."

An attempt was also made to forecast demand and consumption for a specific month for which the customer had a sound basis for expecting the needs specified.

Item IV—Plant operating schedule; present and estimated future:

"Hours operated per day," "number of shifts per day" and "number of days operated per week" for average condition during November, 1941, and for the estimated average conditions of some future month were also obtained.

These data later proved useful in estimating the effect of shifting loads to night and week-end valley periods.

Item V — Power-consuming devices:

A listing was also made of the most important loads of each customer together with indications of the seasonal, monthly, weekly and daily variations in the components that made up this load.

A particular effort was made to show the extent to which the various power-consuming devices influence the customer's maximum demand. Large motors were detailed as to size and function performed by the driven machine.

Continuing Record

When completed the survey findings were co-ordinated with office records and were made a paramount and continuing file. As time passed, "defense activity" became "war production," plants grew and expanded and new plants entered the territory. From time to time supplementary survey forms (Fig. 2) were filled out (in May and October, 1942, and June, 1943) for all 50-kw. customers. These were kept with the original survey forms that now make up the "L-94" records of the company.

To these records are added each month a notation of the demand and energy consumption of each 50-kw. customer for comparison with the previous month and the corresponding month of the previous year. These data are used to establish growth trends. Should L-94 be made effective in the area they will provide the base data for allocation by the Director General for Operations under paragraph (g) (1), (2) and (3) of the order.

Although the survey forms and monthly demand and consumption data provide a complete file on each 50-kw. customer, they did prove to be too cumbersome for ready reference. For convenience the control sheet shown (Fig. 3) was devised. It provides in one master record all the essential demand and use data for each 50-kw. customer. This master control has proved its worth many

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* Prime Defense Supplies—Contracts and orders for products to be delivered to the federal and allied governments, all as outlined under paragraphs a-1 and a-2 of OPM form PD 25-C.

† Other Defense Supplies—Contracts and orders for products for direct or indirect defense requirements which have been assigned a preference rating of A-10 or better, also for materials or equipment required by the holder of a prime defense contract as outlined in PD-25-C.

‡ Other Essential Services—Operations considered vital to public welfare, such as: Fire and Police Protection, Essential Street and Highway Lighting, Churches, Hospitals, Water Supply, etc.

REDUCTION OF USAGE EXHIBIT A—ORDER L-94				EXEMPTION EXHIBIT B ORDER L-94				MONTHLY FUTURE USAGE								
Summer		Winter						Month of	TOTAL		WAR SUPPLIES (A-10 or Better)			ESSENTIAL		
Max. Dem. Kw.	Energy M-KWHrs.	Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.			Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.	%	Max. Dem. Kw.	Energy M-KWHrs.
0	0	0	0	0	0	0	90% of production comes under one classification Schedule B of L-94	7/42	450	160	100	450	160	0	0	0

A few sheets for rapid analysis by director general of operations—should the need arise

times over in making quick studies of industrial operations for the company and the OWU.

Proof of the Pudding

Proof of the usefulness of these detailed records came within six months of the time they were started. In May, 1942, shortly after L-94 was written, the OWU, then the Power Branch of WPB, selected Union Electric and several other systems as "guinea pigs" to determine whether L-94 as then compiled would actually achieve the load relief sought in emergency. The records just described yielded the desired facts quickly and easily. It was at this time that the remarkable similarity between the data compiled by Union Electric and that required by L-94 struck home.

Briefly summarized, the information sought by the Power Branch of WPB in May, 1942, and obtained from records of Union Electric were:

QUESTION—What would be the effect of applying restrictions of Exhibit A, L-94?

ANSWER—Winter season (month of December):

Kw. saving at time of morning peak	21,000
Kw. saving at time of evening peak	35,000
Energy savings kw.-hr. per week	1,685,000

Summer season (month of July):

Kw. saving at time of morning peak	35,000
Kw. saving at time of evening peak	34,500
Energy savings kw.-hr. per week	2,885,000

QUESTION—What will be the effect of shifting loads to night or week and valley periods, without impairing production?

ANSWER—Possible shifting of such loads would be of little if any value to this system. Probably the maximum reduction to night or week-end operation or operating over a longer period would be no more than 15,000 kw.

Of more than 800 customers with demands over 50 kw., total of December, 1941, demands was 376,678 kw. Of these, more than 500 customers with demands totaling 316,132 kw. are operating continuously three shifts, or are office buildings, hotels, etc. Remaining 300 and over customers have sum of total demands of 60,546, divided as follows:

5½ Days or Less per Week

	No.	*Winter Kw.*
One shift	182	23,802
Two shifts	47	17,054
Total	236	40,856

6 Days or Less per Week

	No.	*Winter Kw.*
One shift	58	7,671
Two shifts	33	12,019
Total	91	19,690

QUESTION—What is the demand by classes of customers and estimate of demands by exempt and non-exempt industries?

ANSWER—(For brevity the complete breakdown will not be given here.—*Editors.*)

Winter Season (December, 1941)

	Kw. Demand Morning Peak	*Kw. Demand Evening Peak*	*M Kw.-Hr. Sales Per Mo.*
All classes	550,000	608,600	269,242
Exempt industrial	115,000	101,000	62,200
Non-exempt industrial	165,000	144,000	73,000

Summer Season (August, 1941)

	Kw. Demand Morning Peak	*Kw. Demand Evening Peak*	*M Kw.-Hr. Sales Per Mo.*
All classes	576,900	504,200	257,000
Exempt industrial	107,000	81,000	58,400
Non-exempt industrial	154,000	117,000	68,500

Non-Utility Power Sources

L-94 also calls for operation of non-utility generating facilities "to the extent necessary to relieve the power shortage." Accordingly, a survey of non-utility producers has been made, together with an analysis of the facilities that would be necessary to permit their interconnection with the system. This showed that little capacity could be contributed to the system from this source, either by direct interconnection or indirectly through reduction of demand. However, this may not be the case for other utility properties.

Available Capacity

The surplus available from these plants was eventually found to be 28,145 kw. in 20 plants grouped as follows:

	No.	*Rated Capacity*
I—Plants now connected with system	6	12,700
II—Plants that can be connected to system by use of small amount of material	2	3,500
III—Plants requiring appreciable amount of facilities to connect with system	12	11,945
Total	20	28,145

It is estimated that a quarter of a million dollars would be required to interconnect the twelve plants in group three to the system.

If the Need Arises

A complete list of these available non-utility power producers with full information on plant capacity, connected load and material required for interconnection is maintained by the company and has been submitted to OWU. From this list particular plants to be interconnected with the utility could be quickly selected by the Director General of Operations should the need arise.

Indexes for Non-Condensing Turbine Overhaul

Sequel to condensing turbine article* shows how to detect faulty conditions by critical comparison of stage pressures, temperatures, flows and loads with the values accepted for normal conditions

E. E. HARRIS, Turbine Engineering Department, General Electric Company, Schenectady

STAGE-PRESSURE CURVES for a non-condensing unit should be determined at the time when the unit goes into commercial service because comparison of subsequent curves will show whether the unit has been clogged or damaged and whether it has been adequately cleaned and repaired.

In the earlier article* it was pointed out that if the exhaust pressure is relatively far removed from a stage pressure the stage pressure is a function of the flow through the section so long as a constant pressure ratio is maintained for that group, and that the flow varies as $\sqrt{\frac{P}{V}}$. The unit to fulfill these conditions was a condensing unit in which the stage pressures and consequently the flow are not affected by the exhaust pressure. The relation for flow through a group of fixed areas is that flow varies as $\sqrt{\frac{P}{v}} \times B$, where B is a function of the pressure ratio, hence

$$\frac{\text{Flow}_1}{\text{Flow}_2} = \frac{\sqrt{P_1/v_1}}{\sqrt{P_2/v_2}} \times \frac{B_1}{B_2}$$

then, since the areas are fixed and the pressure ratio is constant, B_1/B_2 becomes unity and flow varies as $\sqrt{\frac{P}{v}}$. When the change in pressure ratio is small the change in B may be neglected.

For a unit with a short energy range or a high pressure-ratio ($\frac{P_2}{P_1}$, where P_2 is the pressure after a group, while P_1 is the pressure ahead of the group), such as for a non-condensing or a topping unit, the flow through a group of stages is changed by a change in pressure ratio across the group. Such a pressure ratio change may be caused by the exhaust pressure being held constant and not sufficiently far removed from the pressure ahead of the group.

Stage pressure curves for various types of non-condensing turbines are represented in Fig. 1 (a, b, c).

The simplest type of unit (Fig. 1a) is one wherein the flow at all times passes through all the stages in the turbine. The first stage may be the governing stage, with the first stage nozzle arc divided into smaller arcs and each of the smaller arcs under the control of an admission valve. Note that the farther the stage is removed from the exhaust the more nearly the pressure vs. flow approaches a straight line and becomes more nearly proportional to flow; at near the maximum flow the first stage shell pressure curve appears to have the same kind of variation as for a condensing unit. Conversely, the nearer a stage is to the exhaust the more the flow pressure relation departs from a line that, when continued, would pass through zero flow at zero pressure. As the flow decreases

*"Indexes that Point to Turbine Overhaul," by E. E. Harris and G. B. Warren, "Electrical World," October 31, 1942.

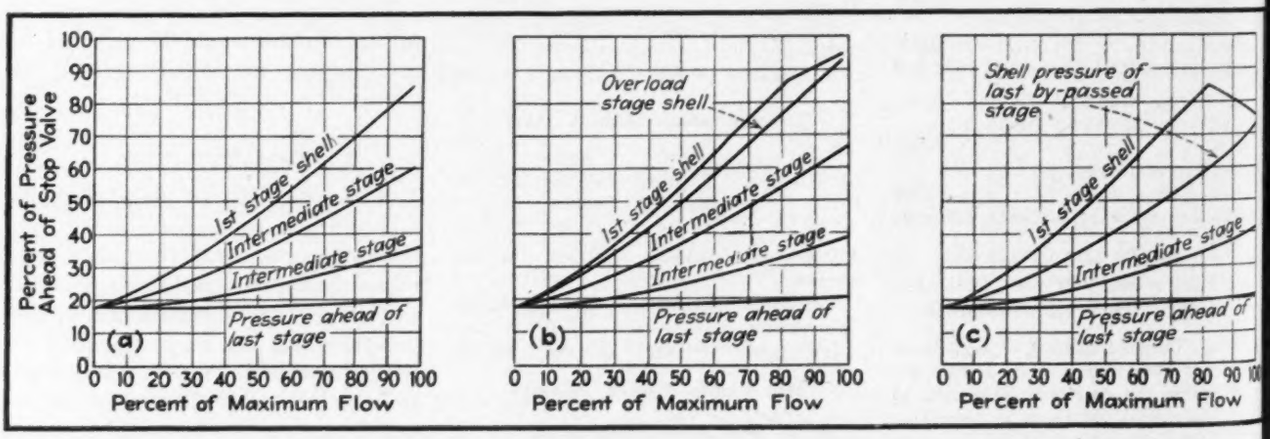

FIG. 1—Stage pressure (in percent of pressure ahead of stop valve) vs. throttle flow for three types of non-condensing turbines. (a) Flow at all times passes through all stages. (b) Unit with overloaded valve. (c) Unit with an internal by-pass or stage valve.

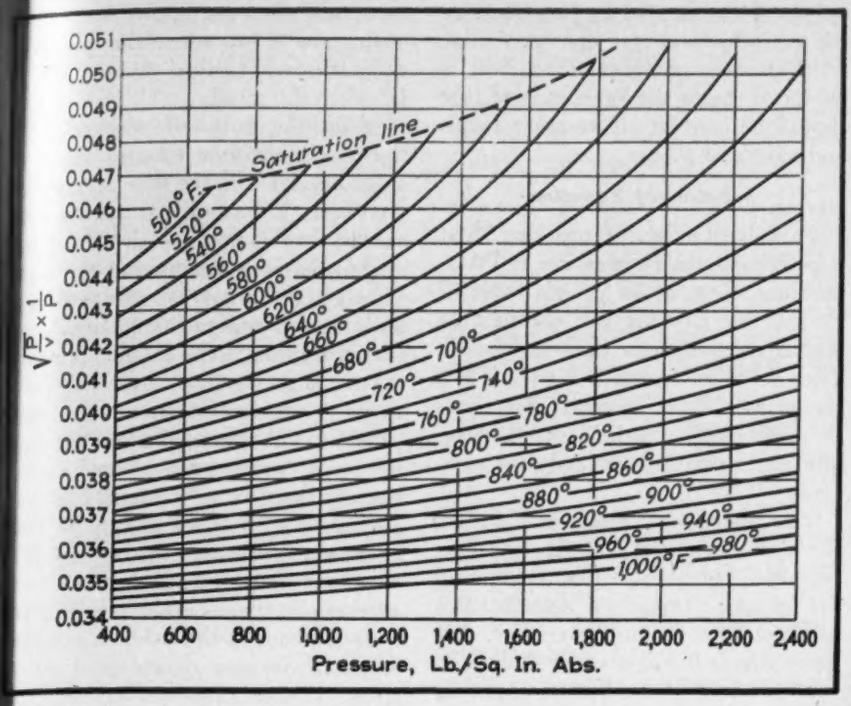

FIG. 2—Curves for obtaining values of $\sqrt{\frac{P}{V}}$

he stage pressure curves tend to atten out, and finally become equal o the back pressure at zero flow.

Fixed Valve Opening Method

Simplest and most convenient ethod of checking the performance f a unit, whether condensing or non-ondensing, is to bring the steam con-itions to contract or some standard et of conditions, with a fixed control alve opening as described in the revious article, and hold the unit at hese conditions until all readings be-ome constant. Readings of the in-ial pressure, initial temperature, ex-aust pressure, exhaust temperature if the exhaust is superheated), hrottle flow, kw. load and stage pres-ures should be made and these read-ngs then compared with previous eadings (such as Fig. 1) or data upplied by the manufacturer for the nit. Corrections will be given later or non-condensing units for inabil-y to hold exactly the proper steam onditions.

Since flow varies as $\sqrt{\frac{P}{v}} \times B$, it s best to plot the stage pressures gainst carefully determined flow. low may be determined by any of he accepted methods which result in value which is the true flow through he respective stages.

The flow may also be determined by using the heat drop load method. In this case it is necessary to determine the initial enthalpy and exhaust enthalpy. These enthalpies are determined by measuring the initial pressure and temperature along with the exhaust pressure and temperature, if the exhaust is in the superheat region. Then

$$\text{Flow} = \frac{3{,}413\ (\text{Kw-Load} + \text{Fixed losses} + \text{Generator losses})}{B_1 - H_2 + H_p}$$

Where: Flow = throttle flow in pounds per hour
H_1 = enthalpy at throttle
H_2 = enthalpy in exhaust
Hp = correction for high-pressure gland leakage the heat content of which does not appear in the turbine exhaust. This correction will normally vary between about 0.5 and 1.2 B.t.u./lb. The 0.5 B.t.u. will apply for a unit with a large steam flow, or a unit with a low exhaust pressure, while the 1.2 will apply for a small flow unit, or a unit with a high exhaust pressure.

Flow Corrections

Ordinarily readings will be taken for conditions other than contract or standard conditions. In these cases it will be necessary to correct to contract or standard conditions. It has already been shown that, if the pressure ratio is kept constant, the flow varies as $\sqrt{\frac{P}{v}}$. From the pressure and temperature a corresponding value of $\sqrt{\frac{P}{v}}/P$ may be read from Fig. 2. Then $\sqrt{\frac{P}{v}}$ equals the vertical ordinate multiplied by the pressure in pounds per square inch absolute. This relation leads to the first correction that should be made with stage pressures and exhaust pressure corrected in the same ratio that the initial pressure is corrected. In making the constant pressure ratio correction the flow should be corrected by the $\sqrt{\frac{P}{v}}$ relation; the B ratio equals unity since the area remains constant along with a constant pressure ratio.

Expansion lines furnished by the manufacturer may be used for determining temperature ahead of a group

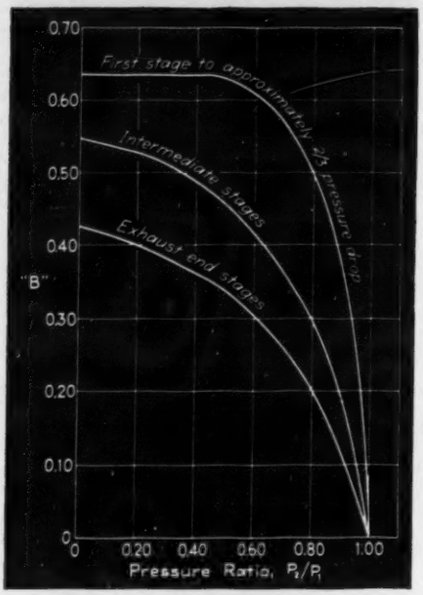

FIG. 3—Flow correction factor B in terms of ratio of pressure P_2, after a particular group of stages, to P_1, the value ahead of the group

of stages. Or, approximate expansion lines may be constructed by connecting the initial pressure and temperature point with the exhaust pressure and temperature point by a straight line on a Mollier diagram. The actual or correct temperatures are not too critical.

The exhaust pressure probably will not be correct and consequently the stage pressures and flow will require corrections for bringing the exhaust pressure to contract or normal conditions.

Assuming that the flow when cor-

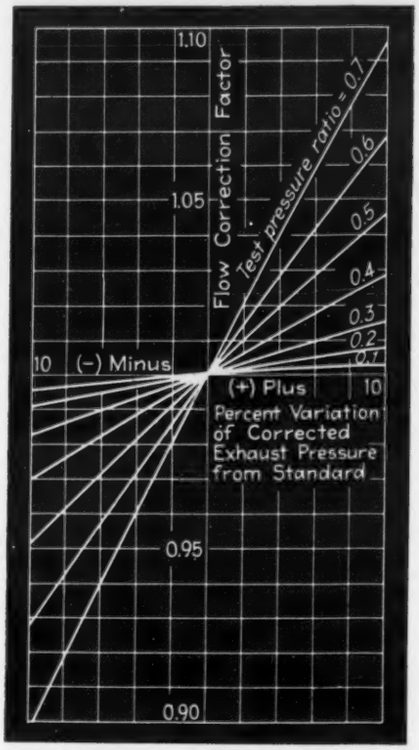

FIG. 4—Flow correction at maximum flow through first stage nozzle.

Test exhaust pressure $\times$ P_c/P_t = corrected exhaust pressure (P_c and P_t are line pressures)

$$\frac{\text{Cor. exh. press} - \text{std. exh. pressure}}{\text{Std. exh. pressure}} \times 100$$

= % variation of corrected exhaust pressure from standard

---

rected for initial conditions remains constant, the new stage pressure for the corrected exhaust pressure will be found by using the following expressions:

$$F = K\sqrt{\frac{P}{v}} \times B$$

since the assumption is made that the flow does not change, and if

$$Z = \frac{\sqrt{\frac{P}{v}}}{P}$$ then it may be shown that

$$P_c = P_t \times \left[\frac{Z_t}{Z_c} \times \frac{B_t}{B_c}\right]$$

where subscript c refers to contract or standard conditions and subscript t refers to test or measured conditions.

Values for B may be found from Fig. 3. Normally the upper curve will be used when dealing with first stage pressures and stage pressures for stages down to approximately two-thirds of the pressure drop, while the lower curve will be used generally for the latter stage pressures, and the middle curve will be used for an intermediate stage. Here again the proper B curves may be furnished by the manufacturer for the particular units under consideration. For a group of stages the same curved line should be used at all pressure ratios and values of B.

Solution of Equation

To solve the above equation, first approximate the P_c pressure and temperature, then, at the proper value of P_2/P_1, the B value for contract or standard conditions may be found. Then solve the equation for P_c. When the proper P_c is assumed the equation will check out the same P_c. Usually about one or two trials are sufficient.

The assumption made in deriving the above equation was that the flow remained constant when correcting for exhaust pressure; actually this assumption may not be correct. For flows where the first stage shell pressure is equal to, or below, about 53 percent of the line pressure (the 53 percent includes the critical pressure drop on the first stage nozzles and the allowance for pressure drop from the pressure ahead of the stop valve to the pressure ahead of the first stage nozzles), the first stage nozzles are passing their maximum flow and any lowering of the first stage shell pressure will not increase the flow into the unit for a constant control valve opening. A small increase in first stage shell pressure will have a tendency to reduce the flow for a constant control valve opening. The change in flow for a small increase in pressure will be negligible, since the change in flow, when the pressure drop is nearly critical pressure drop, is relatively small.

A turbine is usually designed for the maximum flow through the first stage nozzles with the flow through all the stages. The energy distribution assigned for this flow will determine the stage pressures throughout the unit. If, after the areas are assigned and built into the unit, a change in exhaust pressure is made, the exhaust pressure may change the first stage shell pressure. A change of first stage shell pressure will change the flow through the first stage nozzles and consequently the flow to the unit. Fig. 4 is furnished so that the change in flow at the maximum flow through the first stage nozzles may be determined for a change in the exhaust pressure required to make the exhaust pressure equal to contract or standard conditions. Linear interpolation may be used to obtain the flow correction between 53 percent of line pressure and the maximum flow through first stage nozzles. The change in flow for the opening of an overload valve or stage valve may be extrapolated from zero change at 53 percent first stage shell pressure and the flow change at maximum flow through the first stage nozzles.

Corrected Stage Pressures

The stage pressures which have been corrected for initial and exhaust conditions should now be plotted at the final corrected flow. In order to

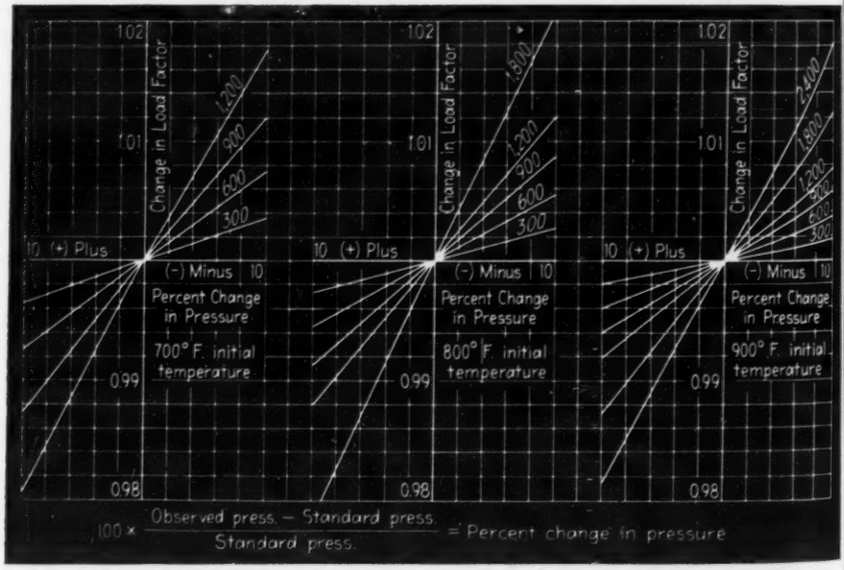

FIG. 5—Initial pressure correction: values on curves are initial pressures in gauge psi.

plot these pressures at the final corrected flow the corrected stage pressures are plotted first at the flow which has been corrected only for initial steam conditions. It will then be necessary to obtain the pressure at the final corrected flow. In order to plot the pressures at the final corrected flow, plot them at the same percentage from the stage pressure curves that the first plotted points differ from the stage pressure curves. A simpler method, and perhaps a sufficiently accurate method, may be used if the change in flow due to an exhaust pressure change is relatively small, in which case lines may be drawn through the original plotted points parallel to the stage pressure curves until they intersect the flow corrected for change in exhaust pressure. The intersection of these lines with the final corrected flow will then indicate the stage pressures at the throttle flow corresponding to contract or standard conditions.

For plotting the first stage shell pressures for flows after overload or stage valve opens, if the overload is into the first stage, if overload is into a lower stage, or for a unit with a stage valve, change the first stage pressure in the same ratio that the flow changes for change in exhaust pressure, and plot at the final corrected flow. This procedure may be followed for partial or full overload valve opening because the pressure will usually be so far away from the exhaust pressure that practically no error will be introduced by such an assumption.

Stage Pressure vs. Kw. Load

Electrical output of a non-condensing or topping unit depends upon the initial steam conditions and exhaust pressure (in other words, the available energy), turbine efficiency, flow through the unit, fixed mechanical losses and the generator losses. From these considerations it will be seen that the stage pressures are not so direct a function of the load as they are a more simple function of flow. However, corrections may be made on the output to bring the output and stage pressures to contract or standard conditions. All corrections are based on a fixed control valve opening the same as when the corrections are made on a flow basis.

The first corrections to be applied will be for initial steam conditions. It has been pointed out before that flow varies as the $\sqrt{\frac{P}{v}}$ for constant pressure ratio. If it is assumed that the available energy and efficiency remain constant, then the kw. load will vary as $\sqrt{\frac{P}{v}}$. A new load may thus be found for the unit with contract or standard initial steam conditions and with an exhaust pressure obtained by keeping the same pressure ratio between the exhaust and line pressure as corresponds to the test conditions. The stage pressures are to be corrected in the same proportion that the initial pressure is changed.

If the initial pressure is changed, with the initial temperature and pressure ratio maintained constant, there will be a change in available energy; consequently this change in available energy will cause a change in load. The change in load corresponding to the change in available energy may be obtained from Fig. 5 by reading the change in load factor from this set of curves. The curves are plotted for 700 deg. F., 800 deg. F. and 900 deg. F. For temperatures other than these interpolation or extrapolation may be used.

Initial Temperature

Correction should next be for initial temperature (Fig. 7); there are two sets of correction factors. The main curves will apply for any pressure ratio down to certain low-pressure ratios, and below these pressure ratios it will be necessary to apply an additional correction to take into account the total change in available energy due to temperature change. The additional correction will be found in the upper right-hand corner of Fig. 7. These two correction factors should be multiplied together to give the total available energy change or change in load due to a temperature change.

Corrections have therefore been made for obtaining a new load due to a change in flow caused by changing the initial steam pressure and temperature and change in available energy caused by changing the initial pressure and temperature. The corrections described so far have assumed the exhaust pressure is still a constant pressure ratio from the line pressure with the pressure ratio still equal to the test pressure ratio. Figs. 4 and 6

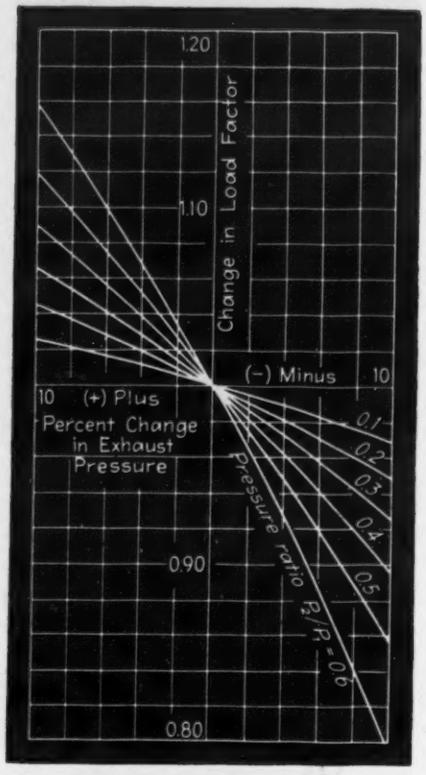

FIG 6—Exhaust pressure correction

$$\frac{\text{(Exhaust pressure} - \text{Standard pressure)}}{\text{Standard pressure}} \times 100 = \%\ \text{change in exhaust pressure}$$

will be used for the exhaust pressure corrections. Fig. 4 describes a flow change due to a change in exhaust pressure and will also represent a load change due to change in flow if the available energy and efficiency remain constant. Fig. 6 will give the change in load due to change in available energy caused by changing the exhaust pressure. The exhaust pressure to be used for determining the percent change in exhaust pressure is the test exhaust pressure corrected for change in initial pressure, while the pressure ratio equals the test pressure ratio.

It has been mentioned previously that a non-condensing or topping unit is usually designed for the maximum flow through the first stage nozzles. For flows less than this flow, such as light load operation, or flows greater than this flow due to overload valves being open, the energy distribution becomes distorted from the design energy layout. This energy distortion will cause a change in efficiency for the unit. The greater the energy range between initial and final conditions the less will be the change in efficiency, while the shorter the energy

range the greater will be the efficiency change. Fig. 8 may be used for determining the change in load caused by a change in efficiency resulting from changing exhaust pressure to contract or standard conditions.

Final Corrected Load

The final corrected load will then be equal to the test load multiplied by the various correction factors:

$$\text{Corrected load} = \text{Test load} \times \sqrt{\frac{P_c \times v_t}{P_t \times v_c}}$$

× initial pressure correction × initial temperture correction × exhaust pressure correction × flow correction × efficiency correction;
where

$\sqrt{\frac{P_c \times v_t}{P_t \times v_c}}$ = Load correction due to change in throttle flow for correcting to contract or standard initial steam conditions with test pressure ratio, use Fig. 2. P and v refer to line conditions.

Initial pressure correction, corrects for change in available energy due to a change in initial pressure and with test pressure ratio, use Fig. 5.

Initial temperature correction, corrects for change in available energy due to change in initial temperature, use Fig. 7.

Exhaust pressure correction, corrects for change in available energy caused by corrections from corrected exhaust pressure to standard or contract exhaust pressure, use Fig. 6.

Flow correction, corrects for change in flow due to change in exhaust pressure, use Fig. 4 if the point under consideration is for the full flow through the first stage nozzles. For flows less than correspond to 53 percent pressure drop, no flow correction shall be made. For flows between 53 percent pressure drop and full flow through first stage nozzles, straight line interpolation may be used. For flows with overload valves open, use extrapolation based upon zero flow change at the full flow through the first stage nozzles.

Efficiency correction, corrects for change in efficiency due to change in pressure ratio, use Fig. 8. The change in efficiency due to a change in temperature is usually negligible for non-condensing units as contrasted to condensing units where a part of the expansion is in the moisture region. The correction curves shown in Fig. 8 represent corrections for a typical unit and apply generally to all units with sufficient accuracy for most purposes. If the turbine user is sufficiently interested in the specific correction curves for the unit under consideration, they may be obtained from the turbine manufacturer.

The same corrections and method of plotting should be used on the stage pressures vs. kw. load as would be used for the stage pressures vs. flow, in that the corrected pressures are first plotted at the load obtained without the flow correction for change in exhaust pressure, and then plotting the stage pressures at a constant percentage from the stage pressure curve at the final corrected load.

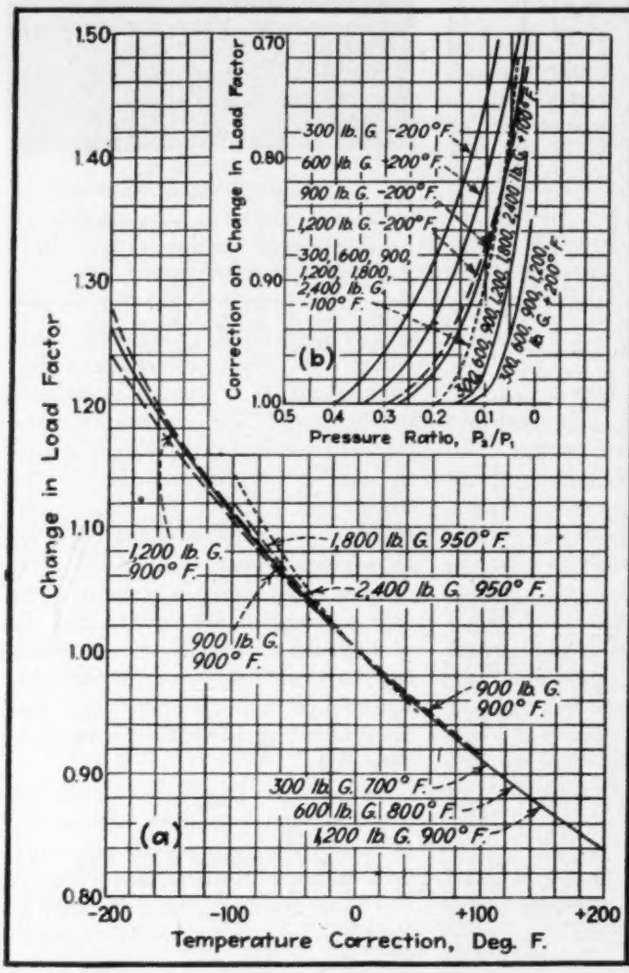
Change in Load Factor
Temperature Correction, Deg. F.
Correction on Change in Load Factor
Pressure Ratio, P₂/P₁
300 lb. G. -200° F.
600 lb. G. -200° F.
900 lb. G. -200° F.
1,200 lb. G. -200° F.
300, 600, 900, 1,200, 1,800, 2,400 lb. G. -100° F.
(a)
(b)
1,200 lb. G. 900° F.
1,800 lb. G. 950° F.
2,400 lb. G. 950° F.
900 lb. G. 900° F.
300 lb. G. 700° F.
600 lb. G. 800° F.
1,200 lb. G. 900° F.

FIG. 7—Temperature corrections for various load factors

(a) Curves for all pressure ratios down to values indicated by intersection of (b) curves with horizontal axis.

(b) Correction representing total change in available energy due to temperature change.

Observed temperature—standard temperature = deg. F. temperature correction.

Corrected kw. = (change in load factor) × (correction on change in load factor) × kw.

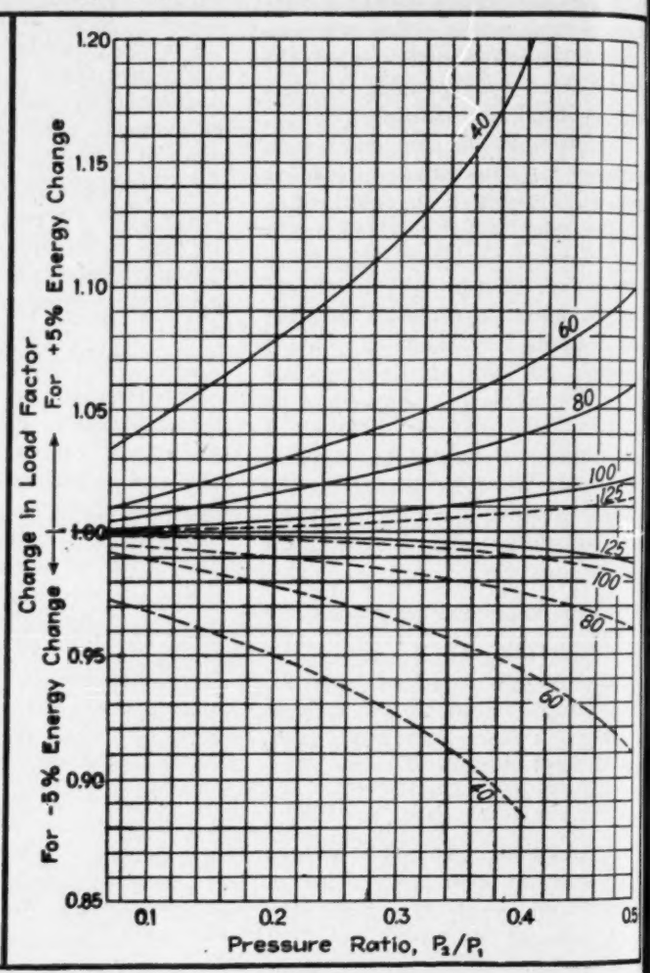

FIG. 8—Curves for 5 percent energy change (use linear interpolation for other values of energy change)

Energy change = (change in load factor, Fig. 5) × (change in load factor, Fig. 6.) — 1

Figures near curves are percent of maximum flow through first stage before overload valves open

Pressure ratio $P_2/P_1 = \frac{\text{Contract exhaust pressure psi. abs.}}{\text{Contract initial pressure psi. abs.}}$

Cross plot above curves for P_2/P_1 for unit under consideration.

PRIORITIES PROBLEMS

Recording Withdrawals Under U-1

Case No. 79

The fact that a utility performs a maintenance, repair or operational job with material for the purchase of which the Office of War Utilities has issued a specific rating does not exempt this material from inclusion in the company's records of scheduled deliveries and withdrawals under paragraphs (f)(1) and (f)(3) of Order U-1. Utilities have often left out of their records material so rated, generally as a result of having misconstrued the wording of paragraph (f) of U-1 as it stood before the September 24 revision.

The last section of the administrative letter which accompanied the September 24 version of U-1 referred specifically to this situation and instructed utilities to "include in your records of deliveries and withdrawals, subject to the restrictions of paragraphs (f)(1) and (f)(3) of U-1, the dollar value of material used in all minor capital additions to your plant, whether the minor capital addition is permitted under the provisions of Utilities Order U-1 or supplementary orders in the U-1 series, or by specific authorization by the War Production Board (such as on form WPB-2774)." A minor capital addition is one all of whose materials have a dollar value of less than $500 in overhead or $1,500 in underground construction.

An example of the incorrect practice is this:

A utility made an extension automatically, under U-1-b, to one of two neighboring houses, and properly included in its U-1 withdrawal records the material used in the project. In preparing to render service under U-1-b to the other house, the company found that it was unable to make the desired connection without exceeding the limitation of 15 pounds of copper imposed by U-1-b. The utility applied to OWU on form WPB-2774 for specific authorization to exceed the restrictions of U-1-b, and, based on peculiar local conditions, the request was granted. Believing that paragraph (f) of the May 31 version of U-1 exempted from withdrawal records material specifically rated by OWU, the utility did not include the material used in the second connection in its records. This was a misconstruction of paragraph (f). Cases similar to this led to the simplification and clarification of that paragraph in the September 24 version.

Enlargement of Service Under U-1-f

Case No. 80

As originally issued, order U-1-f banned any enlargement of service in extensions made under its authority. This prohibition was written into the original order on the basis that there would not be sufficient requests for enlargement of service to warrant issuing the order without the prohibition. Early administrative experience with the order disproved this idea, so the order was amended to permit enlargement of service under U-1-f where provisions of the order otherwise are met. Thus the answer to Question No. 6 of the U-1-f Interpretations published in ELECTRICAL WORLD for October 2, 1943, page 64, is no longer correct.

One of the requests for enlargement of service which led to the amendment was the following:

An industrial customer filling a small sub-contract for wooden parts of a military end product in a small "back-yard" shop which had single-phase service was awarded a larger contract. This necessitated installation of a three-phase motor. Had there been no electric service to his shop he would have been eligible for three-phase service under U-1-f, but since he already had single-phase service the change would have constituted an enlargement, and thus was prohibited under U-1-f. The utility applied on form WPB-2774 for permission to exceed the restrictions of the order, and the permission was granted on the condition that other provisions of U-1-f be adhered to.

From Temporary to Permanent Service

Case No. 81

The fact that a utility has installed service to a temporary customer under the provisions of order U-1-g is no guarantee that it will be allowed to install permanent service if the temporary project ever requires such service. In such cases the determining factor is the use of critical materials necessitated by the transfer to permanent service and not whatever "squatter's rights" the utility rendering temporary service may feel it possesses. Normally, of course, there will be only one electric utility in position to render the desired service, but competitive situations are not uncommon.

One such situation involving this principle was laid before the Office of War Utilities recently. Company A, whose distribution line ran past a construction project, installed temporary lighting service under order U-1-g. When the project was ready for permanent service, it prepared to install it. Company B prepared to install permanent service also, even though it had not attempted to get the temporary business. A survey of the situation showed that Company A would have been required to install 350 feet of primary line to render the permanent service. Company B could render the same service with only 200 feet of primary and a comparable amount of secondary line, using, on an over-all basis, less critical material than Company A.

While the permanent service could have been installed automatically under the provisions of order U-1-d, the situation was placed before OWU by Company A, which considered itself entitled to the business because it had rendered the temporary service. OWU ruled that the over-all use of critical material was the deciding factor, and Company B won the case.

The same decision would have been rendered had the permanent service exceeded the $500 and $1,500 material cost limitations of U-1-d, necessitating specific application on form WPB-2774. Question 5 on this form requires a statement that no other utility can perform the same service using less critical materials, a statement Company A would not have been able to make.

Editorials

S. B. WILLIAMS, *Editor*

The Lesson of El Paso

IF ANY LESSON is to be taken from the defeat last week of public ownership in El Paso, Texas, by a 4 to 1 vote, it is that regardless of the tax-saving incentive holders of operating property stocks cannot look to municipalities as purchasers at good prices of property that has to be separated from the holding company. This isn't the first time that a parent company with orders to divest itself of certain operating property has found public opinion unwilling to permit a transfer from private to public operation.

Some commentators have seen in the El Paso vote a waning interest in public ownership. The fact is that El Paso of itself proves nothing because of a number of issues and interests involved.

While the price on a times-earnings basis was not out of line, it was considerably more than could have been secured from any other utility. The total price was somewhere in the neighborhood of 16 millions, while the historical cost was only approximately 13 millions. Even the reproduction cost new less depreciation was less than the asking figure. So that even though the city would have made a financially good bargain, the price factor did have a part to play in the voters' decision.

Furthermore, only 3,000 votes were cast in a city with a population well in excess of a hundred thousand. While voting was restricted to property holders, the interpretation was so liberal that virtually anybody could have voted. The vote, however, was not representative, as municipal ownership elections have sometimes been.

Very strong opposition to the sale developed among the employees and labor. The former were especially resentful of the parent company in even offering to sell, so strong was their feeling that they did not want to work for a political organization.

The employees and management at El Paso can take the vote as a fine tribute to their service and, nationally, if taken in conjunction with Cleveland, Seattle, Colorado and other places, the industry might well feel that it isn't so much that the public is losing interest in municipal ownership as it is that the public is awaking to the advantages of private ownership and operation.

The splendid job that this industry has done during the war may perhaps be bringing its own reward in the form of an understanding and appreciative public.

Engineering's Alphabetical Melange

WITH more than so many ppm., the B.t.u. transfer drops output sinks from r.m.c., down go the psi., soon the pph. and f.p.s. to the turbine sag and when the hp. falls the lower the kw., even if the r.p.m. and cps. are sustained. Unless corrected at the source by pH, it may be necessary to introduce more combustion control, perhaps by an electronic hook-up based on a TPTG feed-back with r.f.c. in the plate circuit but in which no a.v.c. or h.f.o. is needed.

This business of technical shorthand is perhaps all right when it is confined to a single technical field where abbreviations are intelligible to the initiated. A discard is set up, however, when parts per million, British thermal units, rated maximum capacity, pounds per square inch, pounds per hour, feet per second, horsepower, kilowatts, revolutions per minute, cycles per second, hydrogen ion concentration, tuned-plate-tuned-grid, radio frequency choke, automatic volume control and heat frequency oscillator are scrambled promiscuously and profusely into an alphabetical melange. It is more than the confusion of government agency alphabets. Humble writers refrain and considerate editors frown upon it.

Not How Little But How Much

IN SETTING any post-war goal for residential electricity sales one of the most important decisions to be made is how much can be spent to sell a dollar of added revenue. Before the war there was considerable attention directed toward the cost of adding load, but the approach was one of economy—how little can be spent per dollar of gross. In the post-war era, if the aim is to reach a goal and as quickly as possible, it cannot be a question of how little, but how much.

If added load were a one-time sale, like a piece of merchandise, the economy of selling would be important, but load continues to produce revenue year after year. If we consider the total revenue from the sale of added residential load the rule of economy can be made to apply, but it will be found, if we do so, that the application of such economical cost to the first year's revenue will produce a much larger figure than the industry has previously considered proper.

On that basis it may be found that considerably more than a dollar can be spent to produce a dollar of first-year revenue. One sales manager recently said that on some loads he felt he could afford to spend up to seven dollars per first-year dollar. It is doubtful if it will be found

desirable or even necessary to spend so much to add load, but it is desirable that every sales manager find out what the economic limits are.

The important thing after the war is going to be the rapidity with which usage can be expanded, for on that depends employment, better public relations and the ability through volume to lower rates and stand off government competition or ownership. If that philosophy of selling is accepted, then instead of fifty cents sales cost per dollar of one year's added revenue we may go to two dollars or three, or in some cases even five. How much faster can load be added with sales allowances of such magnitude than with the smaller economy percentages?

Weather Information

WEATHER or no weather, the electric power service has to go on. When the elements go on a rampage the power companies have to battle with them to keep plants working and lines functioning. It is steadily getting more important for utilities to have all the advance information about ensuing weather as possible. They can never have too much too early and too reliably. It was encouraging, therefore, that the Weather Bureau recently authorized the resumption of broadcasting daily local forecasts. Power companies have meanwhile been enabled to have forecasts over protected channels. When war restrictions relax still further there should be machinery set up to collect and distribute more news of forthcoming meteorological trends.

The Weather Bureau presumably was instituted originally to tell the farmer when he could cut hay or figure on rain that would save his corn. Since then it has expanded to serve a variety of activities. With the farmer today relying more and more on electric service, it is going to be indirectly helpful to him, afresh, if the power companies and the co-operatives which they supply can have advance warnings of conditions which will impair service continuity unless they are prepared to stride the disturbances.

Two recent papers bring the topic forcibly to the surface. A. E. Davison of the Hydro-Electric Power Commission told a joint meeting of the A.I.E.E. and the Royal Meteorological Society in Toronto that it was far more than just a matter of glaze, thunderstorms and wind. It involves storm paths and speed, precipitation (floods and hydro storage), wind velocities, expanded Thietype systems, magnetic storms interfering with relaying and communication, temperature regimes, threat of icing (insulator flashover), stream gauging and frost depth. L. A. Dryar recently told the E.E.I. at Cleveland how much effect there is on load (and the provision of spinning reserves to meet it) from temperature ranges and changes, cloudiness, rain either day or night, snow blanket and wind, the dispatching problem being to weigh these respective factors when they occur concomitantly.

There are then two angles from which weather has a bearing on power supply. From both aspects—sustained service through destructive disturbance and ample capacity though upsetting changes—it is extremely helpful to be forewarned. When the war conditions ease it is going to be very worth while to revive the 1934 and 1940 conferences initiated by P.E.A. to pave the way for quicker, longer-range and more comprehensive forecasting. It may well be that the war itself will have added substantially to improved techniques and facilities.

D.C. Transmission Progress

EIGHT YEARS AGO the first d.c. power transmission in this country was initiated in the form of double electronic conversion from and to a.c. at the extremities of a 17-mile line, from the Mechanicville substation of New York Power & Light Corporation to the General Electric Company substation at Schenectady. At the source end the capacity applied was 5,250 kw. at 12 kv., 40 cycles. Local requirements at the delivery end called for 13.2 kv., 60 cycles. So the enterprise was in no way hampered by the fact that 40-cycle energy had to appear as 60-cycle energy at the other end.

Originally the scheme was founded on the monocyclic square and its nicety of converting from constant potential input to constant current output; the only tubes available were of glass-body, hot-cathode design and there was natural concern about their ability to survive the occasional short circuits logically to be entailed with constant-potential operation. Line current was set at 175 amperes and maximum line voltage at 30 kv.

The scheme proved fundamentally sound and workable, with the usual "growing pains" of any similar revolutionary experiment. Economically, however, the constant-current system entailed one too many transformations to permit it to compete for a chance at loads and distances more common in transmission practice. Dr. E. F. W. Alexanderson tackled the problems of constant-potential conversion and of protecting the tubes against fault currents. Four years later (June, 1940) the equipment was thus converted, still, however, using the glass hot-cathode tubes. Meanwhile, the ignitron tube with grid control had come along to offer more amperes, higher voltage, sturdier construction, lower cost and better protection against overcurrents. During the past year both terminals have been changed over.

As it now stands this pioneer installation still takes the 12-kv., 40-cycle output, but rectifies it to 17 kv. d.c. for conversion to 13.2 kv., 60 cycles at the mercury turbogenerator busbars. Credit is due both participants for the continuous study that has solved a great many of the critical problems which had deterred d.c. from reasserting itself. D.c. yielded once to a.c., but it has been armed for a reinvasion of the field wherever the economies justify. So long as we hold to present loads and distances, however, the advantage appears to lie with a.c.

Washington Comment

By R. N. LARKIN, Washington Correspondent

Power Renegotiation Confusion

AFTER a year of operation three results of the President's October 22, 1942, "cheapest power" directive stand out. In order of their importance, these results are that:

1. Considerable savings have been realized by the federal government, with considerably more in prospect.

2. Considerable confusion over the exact meaning, process and scope of renegotiation exists, not only among electric utilities but in official Washington as well.

3. FPC, with a war-crippled staff, faces an increasingly large backlog of electric service contracts and proposals on which it is obligated to rule.

Savings

No over-all figure on the power involved or the money saved thus far is available, but fragmentary reports indicate the extent of the savings which may be had. The War Department recently announced annual savings of $2,869,000 on about 100 contracts which have been renegotiated, and expects that as many as 75 more, as well as any forthcoming contract proposals which may be objected to by FPC, will require renegotiation (ELECTRICAL WORLD, October 23, 1943, page 4). Last June, when its backlog was by no means so large, FPC's vice-chairman, Basil Manly, reported savings of $1,560,000 in rates and $1,983,000 in facilities charges on the first 96 contracts to be handled (ELECTRICAL WORLD, June 12, 1943, page 85). Most of Manly's rate savings are included in the Army's more recent announcement, but when it is realized that these rate savings are available annually and that they have been gleaned from only a small portion of the contracts which must clear through FPC, it is apparent that there was gold in the President's October 22 directive.

The confusion over renegotiation of electric service contracts is understandable. It stems from the fact that there are two types of renegotiation, each based on a different pronouncement, one of which may properly be called "rate renegotiation," and the other "recapture renegotiation."

"Rate renegotiation" is the process required under the October 22, 1942, directive. It has no standing on the statute books, but is official nevertheless. There is nothing therein which gives FPC jurisdiction over recapture. FPC's jurisdiction is confined to a review of the offered or existing rates and facilities charges, a determination of whether they are just, and the establishment of new rates and charges where proposed or existing rates or charges are found to be unjust.

Recapture

"Recapture renegotiation" is statutory under an act of Congress which requires procurement agencies to recapture those profits which they regard as excessive. Currently, it applies to all contracts under which sales in excess of $100,000 yearly are made to the government unless the contracts are specifically exempted. Obviously this form of renegotiation would not be applied to the rates in a proposed contract for electric service, and generally would not be applied to contracts whose rates and charges have been approved or renegotiated by FPC under 1942 directive. It may be applied as a result of "rate renegotiation" by FPC if a procurement agency chooses to do so.

Before Congress now and regarded as certain of passage is an amendment to the renegotiation law which would exempt from "recapture renegotiation" contracts involving annual sales of less than $500,000, and the exemption may be boosted to $1,000,000. Either exemption would have considerable effect on the recapture possibilities of FPC's backlog, but neither would affect FPC's jurisdiction for "rate renegotiation."

The Secretary of War has exempted from statutory or "recapture" renegotiation those contracts in the jurisdiction of a public regulatory body. This does not exclude FPC from reviewing and advising renegotiation of rates. The Army has announced, however, that "if at any time experience indicates the desirability of using statutory renegotiation where a public regulatory body has jurisdiction, the exemption will be rescinded." Thus the Army intends to retain the right of "recapture" renegotiation for those contracts whose rates have yielded excessive profits. Generally, and until its official policy of exemption is changed, the Army does not intend to recapture the difference between what was paid on the original rate in any contract and what would have been paid had the renegotiated rate applied from the start of service.

Facilities charges were not so exempted from statutory or "recapture" renegotiation, and the Army thus far has recaptured $837,748 in excessive or unauthorized facilities charges.

Concurrent Renegotiation

Though without obligation FPC would probably point out any need for "recapture renegotiation" found during the conference between the utility, the procurement agency and itself which accompanies "rate renegotiation," and any recapture desired by the procurement agency might be effected concurrently with the "rate renegotiation."

Meanwhile, as new contract proposals are agreed upon by procurement agencies and utilities, FPC backlog grows to dismal proportions for its limited staff. Early in October 859 contracts and proposals had been submitted. Of these, 471 existing contracts subject to renegotiation are inactive under FPC's policy of cleaning up proposals first. One hundred and sixty-two contracts or proposals have been disposed of, and 226 are under active consideration. Of the latter, 126 are new proposals which are being reviewed and 100 are actually being renegotiated. Those disposed of to date involve a total demand of more than 1,000,000 kw.

NEWS OF THE WEEK

Coast Dimouts Canceled; Conservation Continued

Announcement by Army and Navy departments that Atlantic, Pacific and Gulf dimouts are canceled as of November 1 accompanied by strong request that conservation program not be relaxed

Cancellation of the military dimouts along the Atlantic, Pacific and Gulf coasts by the War and Navy departments was accompanied by a strong request on the part of the services that no relaxation of the voluntary electric conservation drive be indulged in. The dimouts, imposed to protect coastwise merchant shipping which was being silhouetted by sky glow and made easy prey for submarines, were canceled, effective November 1, because of the success of last summer's vigorous drive against submarines, which cut shipping losses to new lows.

OWU Advised Services

The Office of War Utilities, questioned by the services as to what effect cancellation of the dimout would have on its conservation campaign, advised the services that if they saw no military reasons for continuing the ban, it should not be maintained for the purposes of the conservation drive, as that would discriminate against the coastal regions. It urged, however, that the services emphasize the necessity for conservation of electricity in announcing the cancellation.

Military and naval authorities warned that if the U-boat menace to coastal waters reasserted itself, coastal communities must be prepared for total blackouts. The Commander-in-Chief of the fleet will be the judge of what constitutes a serious menace.

The War Production Board, the Petroleum Administration for War, the Solid Fuels Administration and the Office of Defense Transportation, government agencies co-operating in the over-all voluntary conservation campaign, joined the military services in warning against relaxation of the conservation program.

"Without co-operation in the voluntary program," it was emphasized, "mandatory restrictions on non-essential lighting could become necessary. Such restrictions would be invoked not only in the present dimout zones, but on a nation-wide basis to whatever degree circumstances might warrant."

Easing of the Pacific Coast dimout October 10 (ELECTRICAL WORLD, October 16, 1943, page 72) is reported to have caused considerable trouble in carrying on the conservation campaign in that region.

Communities Warned

All communities now subject to the military dimout have been requested to be ready to resume the restrictions on orders of respective defense commanders. Any such orders would be issued at the request of sea frontier commanders, but only in the event of a resumption of U-boat activity in coastal waters.

The decision to lift the dimout was reached by a joint Army-Navy dimout policy committee organized last summer, when losses from submarine action dropped to almost negligible levels. Cancellation was recommended by Navy Under-Secretary James Forrestal and concurred in by War Secretary Henry L. Stimson.

USE LESS··SO OUR FIGHTING FORCES WILL HAVE MORE!

CONSERVATION SYMBOL—A little reminiscent of the NRA blue eagle is OWI's new official seal of the over-all conservation drive which should be used on all advertising copy with the now-official slogan "Conserve Critical Resources For War"

Edmonton Power Pool Considered

In view of a possible shortage of coal which might create a shortage of power the creation of a power pool is now being considered at Edmonton, Alta. The Edmonton city finance committee has adopted the recommendation of its city commissioner and R. C. Watson, municipal power plant superintendent, for formation of such a pool and it is entering into an arrangement with the Calgary Power Co.

Under the terms of the four point proposal the Calgary company would on request supply Edmonton with power generated by its gas-fired boilers at Victoria Park plant at Calgary, Alta. The agreement also provides for the Calgary Power Co. purchasing from the East Kootenay Power Co. any available

surplus hydro-electric energy which would relieve load on the Calgary system and permit diversion of more of the Calgary company's power to Edmonton. In return the Edmonton municipal system would pay monthly for all power generated by the Calgary company on the basis of the city's present increment costs and pay 2.1 mills per kilowatt-hour for all energy supplied through purchases made by the Calgary company from the East Kootenay Power Co. of British Columbia. The power pool agreement would not affect existing agreements between the city of Edmonton and the Calgary Power Co.

At the same time the point is in the minds of officials of both systems that formation of the power pool will not be a complete solution in that peak demands come at the same time during the winter in Edmonton and Calgary. However, it is felt that a partial solution can be achieved, as the Calgary system has some surplus power, and by using gas as firing it would be able to maintain full capacity production in coal curtailed operations of the Edmonton plant.

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Shasta Gates Will Close January 1

Office of War Utilities officials are confident that the gates of Shasta Dam, in north central California, will be closed by January 1 in time to catch seasonal water flow which will allow power generation to start in March.

Work at Shasta has been slowed by a high turnover rate among laborers at the job. Efforts to improve the labor situation on the job were made recently by director B. J. Sickler of the Power Division and regional engineer V. M. Marquis who visited the job and conferred on the situation with San Francisco area representatives of the War Manpower Commission.

As a result of the conferences, labor recruiting for the project will be allowed on a much broader basis than was permissible heretofore under WMC regional controls. The Redding, Calif., office of the United States Employment Service, will attempt to obtain the necessary 150 extra laborers and will cooperate with the Shasta contractor in attempting to cut down labor turnover. Exit interviews will be required of men who attempt to leave the job, and certificates of availability will not be issued as easily as they have been.

No difficulty has been encountered in installing the two 75,000-kw. generators which have been scheduled for the Shasta powerhouse.

Move to Agree on War Utility Projects

OWU, FWA, FSA and President Seek Formula

A move to eliminate considerable duplication of effort in determining which utility projects are necessary to the war effort has been agreed upon by the Office of War Utilities, the Federal Works Agency, the Federal Security Agency and the President, but OWU will not lose its jurisdiction over determination and allocation of supply, materials and equipment through the agreement.

The program resulted principally from the assignment of OWU water division engineers to check data already gathered by FWA. Under the new plan FWA determines which projects shall be sent to the President for a determination of essentiality to the war effort, after projects have been drawn up by FSA and FWA.

Division Authority

In spite of reports that WPB would be called upon merely to assign priorities to those projects found essential and that it would be by-passed in the matter of determining essentiality, OWU officials were notified that:

"You appreciate, of course, that nothing in this statement of plans and procedures is intended in any way to impair the responsibility of . . . (any) division for determining over-all supply and requirements and over-all materials and equipment requirements and for taking all necessary actions in order to make such determinations and to allocate available materials and equipment.

"As in the past, the OWU will continue to determine (a) availability of materials and equipment for FWA projects; (b) relative essentiality as between projects submitted by FWA and other . . . projects either of FWA or other agencies; and (c) to what, if any, extent the submitted project should be modified for the purpose of conserving materials and equipment for assuring adequate (utility) supply for the war program."

The President had asked FWA, FSA and the Budget Director to submit a program to be followed in carrying out a community facilities program under the Lanham Act of 1940. In determining which projects should be sent to the President for a finding of essentiality, FWA was to circularize interested agencies, which would not have the power of veto but would be confined to advising on need and functional design, according to published reports which held that WPB was being sidetracked by the program.

NEWS BRIEFS

CONSOLIDATED EDISON OF NEW YORK has sold the old Duane Street electric plant to the Metals Reserve Corp., which will demolish the structure for scrap. Duane Street plant had not been operated as a generating station since 1928, but was continued in use as a substation until this year. It was the second important generating station in the original Edison system and began operating as a direct-current plant in 1891, three years before the Pearl Street station was shut down. It made electrical history in 1898 when it was the scene of the first commercial high-voltage transmission of electricity. It is estimated the structure will yield 3,000 tons of steel and 20 tons of copper.

THE SENATE HAS ADOPTED a resolution designating February 11, 1944, as Thomas Alva Edison day.

FLORIDA POWER & LIGHT CO. is abandoning the 40-hour work week, which has been in effect for the past ten years. Vice-president H. E. Simpson said that wartime labor shortages forced the adoption of a 44-hour week for the 1,313 employees of the company. Simpson said the company had lost 800 employees, 500 of them to the armed services.

TECHNICAL SERGEANT THOMAS J. KELLETT, formerly of the Newark, N. J., service district of G. E.'s lamp department, has been decorated with the Distinguished Flying Cross. Sergeant Kellett has made more than 50 missions over Jap-held territory.

OHIO COMMUNITIES at the western fringe of the eastern wartime zone are switching to Eastern Standard time. Cincinnati experienced a 7 percent increase in feeder amperes on the first Tuesday peak; residentials went up 10.

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Abe Fortas in Navy

Abe Fortas, Under Secretary of the Interior, went on active duty with the Navy as an apprentice seaman this week. He was inducted a week ago after winding up his work at the Interior Department (ELECTRICAL WORLD, October 16, 1943, page 75).

Coal Purchase Priority System Under Consideration

Utilities would rank second under contemplated program — Restriction on fuel oil for power generation relaxed in reversal of situation obtaining a year ago — Oil-to-coal conversion out

The Solid Fuels Administration for War is drafting a system of priorities for the purchase of coal and restrictions on the use of fuel oil for the generation of electricity have been widely relaxed as the electric utility fuel situation has almost completely reversed its position of a year ago.

It was emphasized that there had been no decision early this week to establish a priorities system for coal, and the coal industry was opposing the move on the ground that its own program (ELECTRICAL WORLD, October 2, page 68) has not proved inadequate. Nevertheless, a program similar to that urged on solid fuels early in its history is under consideration.

Utilities Rank Second

Under the proposed priorities system electric utilities would rank second, after metallurgical users and manufacturers of gas and certain chemicals. Retail suppliers would rank third and other industrial users fourth. Operating base for electric utilities would be 60 days supply under the proposed program. Companies which had more than that supply would not be allowed to apply preference ratings to their full monthly burn until their stockpiles were reduced to 60 days. Companies with less than this amount would be allowed to apply preference ratings to their monthly burn plus stipulated percentages until their stocks were built up to the operating level.

Relations on the use of fuel oil for power generation followed rapidly on the heels of the complete halting of the oil-to-coal conversion program. Major developments included:

1. Agreement between the Office of War Utilities and the Petroleum Administration for War on a program whereby certain coal-fired capacity will be shut down and oil-fired capacity returned to service.

2. Revocation, effective November 2 in PAW District 1 only, of amendment 50 to the Office of Price Administration's ration order 11, which required interconnection of that oil-fired capacity which could be displaced by coal capacity.

The OWU-PAW program, which is expected to affect approximately several hundred thousands kilowatts of capacity in PAW Districts 1 and 2, grew out of the surplus of residual fuel oil in these areas, which cover the United States as far west as Montana, except Texas. Thus far, 30 utilities have been advised to apply to PAW for exceptions to paragraph (b) (3) of Petroleum Distribution Order No. 13. The program entails no reconversion back to coal and will not necessarily be permanent, but is rather designed to save what coal can be saved by the use of surplus oil stocks. Obviously, the program will not be applied to the detriment of total capacity. No estimate of fuel savings was available immediately. Companies are asked by OWU not to apply for the exception unless advised to do so.

Revocation of amendment No. 50 November 2 will allow numerous companies whose oil-fired capacity was displaceable by coal-fired energy to break off their mandatory intake of coal-fired energy and resume oil operations. OWU officials were unable to cite the number of companies affected, but noted that they had turned down 58 appeals from the ruling when it was invoked last year. It was emphasized that this revocation will apply only in PAW District 1, which is made up of 17 Atlantic Coast states.

LIFE SAVERS—President L. E. Seekins (rt.) of Lowell (Mass.) Electric Light Corporation, pins the Edison Electric Institute Medal upon the lapel of Harry P. McCaffrey for saving the life of Frank V. Mahoney (left), substation foreman, from electric shock sustained during trouble shooting at Billerica after a lightning storm. Mr. McCaffrey and J. William Rondeau, both linemen for this New England Power System utility, received E.E.I. certificates in connection with Mr. Mahoney's rescue

Puget Buys 30,000 Kw. of Bonneville Power

Execution of a contract under which the Bonneville Power Administration will sell 30,000 kw. of prime power to the Puget Sound Power & Light Co. was announced October 18 by Frank McLaughlin, president of the company, and Paul W. Hand, manager of the Puget Sound district of Bonneville. The contract is effective from October 1, 1943, to September 30, 1944.

Use of Columbia River hydro-electric power will reduce steam plant operation during the company year, Bonneville said, thereby making possible an annual saving of millions of gallons of fuel oil in accordance with the national conservation program.

The Bonneville power will be delivered to Puget Sound at the company's switching station at Renton, Wash., where the two systems are interconnected, and at any other interconnection with the Northwest power pool through which the power scheduled under the contract may flow.

The company will buy firm power at Bonneville's wholesale power rate of $17.50 a year per kilowatt of billing demand. Dump energy will also be used when available to displace fuel generation, at 2.5 mills per kw.-hr.

Boren to Press Bill Curtailing SEC Powers

Charges commission with "falling down on its job" — Declines comment on President's blast at SEC critics — McConnaughey appointed to succeed Edmund Burke, resigned, as SEC commissioner

Charging the Securities and Exchange Commission with being "one of the worst types of bureau" and with "falling down on its job," Rep. Lyle Boren, Oklahoma Democrat, told ELECTRICAL WORLD this week that he would press for enactment of his bills which would vastly curtail SEC's power over proxy rules and which would suspend for the duration and one year any attempt by SEC to exercise its powers under the "death sentence" clause of the Holding Company Act.

President Blasts Critics

Boren declined comment on the President's recent blast against critics of the SEC who, the Chief Executive charged, are trying to get rid of the agency and get back to "that awful thing called the good old days." It was widely believed in Washington that renewed interest in Boren's proposals motivated the blast.

Boren said he expected hearings on his proxy bill would start after November 15, and added that this bill would be considered before that suspending SEC's power to order divestments.

"I want to see SEC do the job it is supposed to do—that much and no more," Boren declared. He added that SEC's "timing" on ordering divestments under the death sentence clause is particularly bad since it costs "millions of man-hours yearly" in complying with SEC requests "and the thousand and one other things SEC theorists want to do" when the manpower is one of the most critical resources of the nation.

Boren said he was concerned also with "what appears to be an application of SEC's powers to force utilities into public ownership." He pointed out that he was not opposed to public ownership if the people choose to have it, but that he opposed having it forced into ascendance by an agency and without a clear-cut expression of sentiment by the voters.

McConnaughey Appointed

The President, meanwhile, followed his criticism of attacks on SEC with the nomination of Robert Dendall McConnaughey, deputy governor of the Farm Credit Administration, to membership on SEC, replacing Edmund Burke, Jr., who resigned "for family reasons."

McConnaughey was born at Dayton, Ohio, in 1904, was graduated from Dartmouth College in 1926 and from Harvard Law School in 1929. After short private practice he entered public life as an attorney for the old Agricultural Adjustment Administration. He moved to the Department of Agriculture, the staff of the Senate Interstate Commerce Committee investigating railroad reorganization and then returned briefly to private practice. He returned to the Agriculture department, moved to the Solicitor-General's Department, then became general counsel for Farm Credit before becoming deputy governor of that agency.

Burke had been named a commissioner in 1941, replacing Leon Henderson, who left SEC to head the Office of Price Administration and Civilian Supply. He joined SEC in 1935 after two years with the Public Works Administration. In 1938 he was named assistant director of the old Reorganization division of SEC, heading that division a year later and later becoming commissioner. For six years before entering government service Burke practiced privately in New York City, to which practice he will return.

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Year's Stream Flow Was Sixth Highest

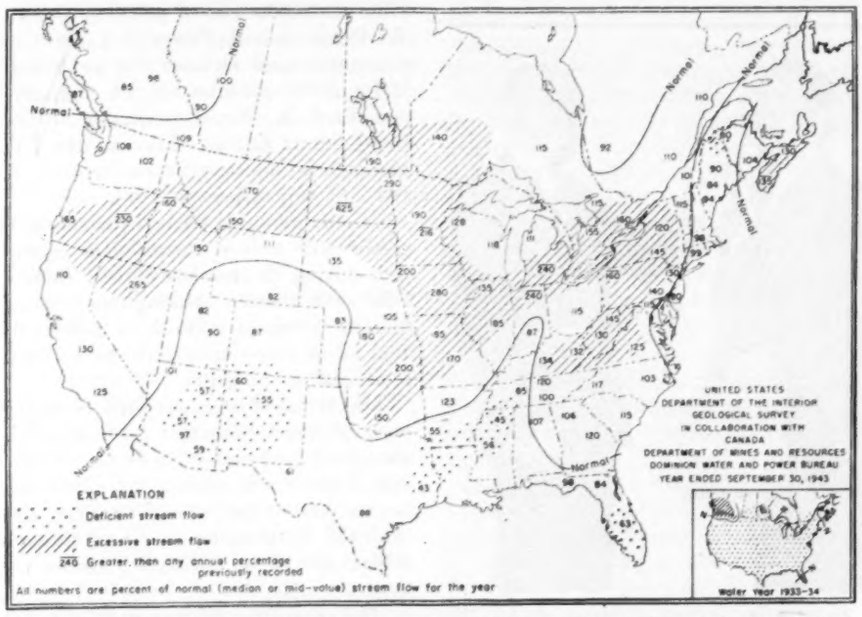
Stream flow in the United States during the year ended September 30 was the sixth highest since 1910, and annual flow at nine representative stations was the greatest on record, according to the annual water resources review, jointly issued by the U. S. Department of the Interior and the Dominion Water and Power Bureau of Canada. Considering stream flow as the index of wetness, the report said, the northern part of the U. S. had the second wettest year on record.

In the southern half of the United States stream flow was widely and frequently sub-normal and drought conditions were dominant in southern Florida, Mississippi, Louisiana, southern Arkansas, eastern Texas, New Mexico, Arizona, southern Nevada and southern Utah. The annual flow of all representative streams, however, was above previous minima of record.

On an areal basis annual runoff was excessive in 31 percent, deficient in 10 percent, and normal or near normal in 59 percent of the area of the United States.

Storage for Power

In the northeast, embracing Quebec, Nova Scotia and New England, storage for power during the year was about the


Normal
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
IN COLLABORATION WITH
CANADA
DEPARTMENT OF MINES AND RESOURCES
DOMINION WATER AND POWER BUREAU
YEAR ENDED SEPTEMBER 30, 1943
EXPLANATION
Deficient stream flow
Excessive stream flow
240 Greater than any annual percentage previously recorded
All numbers are percent of normal (median or mid-value) stream flow for the year
water year 1933-34

YEAR'S STREAM FLOW—The chart above shows the percentage of normal stream flow for the year ended September 30, 1943. Slanting lines indicate excessive stream flow, dotted portions show deficient stream flow. Center curving line represents normal. Numbers with lines above them indicate areas where stream flow was greater than any annual percentage previously recorded. Inset shows water year of 1933-34, when droughts were rampant, as a comparison

ame as the previous year and somewhat greater than average. In the southeast, storage in 11 major power reservoirs was 77 percent of storage available as of September 30, 1942, reflecting increased power demands coupled with sub-normal stream flow during August and September. During the year Douglas, Ocoee No. 3, Appalachia and Fort Loudon reservoirs were put in operation so that total storage in the Tennessee Valley is now considerably greater than at this time last year. In the west-central region: In Wisconsin storage in two reservoirs in the headwaters of the Chippewa is about average, but 71 percent of last year; storage in the headwaters of the Mississippi in Minnesota is about 108 percent of last year and 140 percent of average. Five power reservoirs in Missouri, Texas and Oklahoma contain but 73 percent of the amount of water held last year.

Storage for power in the west shows that major power reservoirs in Montana hold about the same as last year with the exception of Fort Peck which, though still filling, has more than doubled the acre-feet of storage from July to September. Excluding Grand Coulee, power storage in Washington as indicated by records from Ariel, Cushman, Lake Chelan and Ruby reservoirs is 95 percent of last year.

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New Standards for Coast School Lighting

A co-operative undertaking of long standing for betterment of schoolhouse lighting in California has culminated in a three-point program, first step of which was revision and a new edition of "Recommended Practices for Lighting California Schools." This 19-page bulletin was prepared by the research committee of the Sight Conservation Council of Northern California for the California State Department of Education, Division of Schoolhouse Planning, at Sacramento, and was published by that department.

Second step will be to make field tests of acceptance and understandability of standards set up, together with visual demonstrations of important factors. For this purpose will be chosen selected groups of school trustees, business management, school supervisors and school nurses.

Following the war a third phase embracing a broader educational program will be undertaken. Proper classroom conditioning has been a co-operative project receiving voluntary support of the State Department of Education, the Sight Conservation Council and school officials over a long period of time in the state of California.

$3 Billion Post-War Reclamation Program

Commissioner Bashore tells Denver convention of National Reclamation Association that program will provide employment for many of western states men demobilized after the war

A post-war public works program calling for an expenditure of $3,000,000,000 for the conversion, over a period of five to ten years, of Western water and land resources "into the most useful channels" is being outlined by the Bureau of Reclamation of the Department of the Interior, Harry W. Bashore, commissioner, told the National Reclamation Association's twelfth annual convention at Denver, October 28. A primary consideration of the program, Mr. Bashore said, will be the prompt employment for "a substantial number of" the 2,900,000 men from the 17 western irrigation states who will be demobilized from the armed services and war industries.

The investment of the federal government in facilities for the conservation and use of western water resources is now at the high water mark of $870,000,000, Mr. Bashore declared: Dams built by the Bureau of Reclamation are to have an aggregate capacity of more than 64,000,000 acre-feet—80 percent of the storage in the West, he said, adding that they have made it possible in two years to double the installed capacity and triple the output of hydroelectric energy in Reclamation plants.

"The total capacity of our 30 power houses today is nearly 2,000,000 kw.," Mr. Bashore said. "During this calendar year these plants will generate more than 12,000,000,000 kw.-hr. of electrical energy . . . As in the field of war foods, the bureau has been limited in extending its power facilities. It could add another 1,000,000 kw. by 1946 if new generators should be found necessary. Under present restrictions, we are limited to making available an additional 450,000 kw. by October, 1944."

Another speaker at the convention, Michael W. Strauss, first assistant secretary of the Interior, discussing future land and water development, said that "a few have the misconception that there is some sort of inherent and irreconcilable conflict between consumptive use of water for irrigation or power

TOASTMASTER GETS ITS "E"—On October 10, the Toastmaster Products Division of McGraw Electric Co., Elgin, Ill., celebrated the award of the Army-Navy "E" to the plant. In the group back of the banner are, in the usual order, Rear Admiral Alex M. Charlton; Max McGraw, president of McGraw Electric; Commander Miles H. Hubbard; D. Scott Campbell, executive vice-president of McGraw Electric; Murray Ireland, vice-president in charge of manufacturing; Capt. Robert Henderson, USN, who made the presentation, and Lieut. Col. A. B. Pattou

and the control of water to prevent floods and for navigation." The Department of the Interior, he said, is getting "a little worn" from hearing that there has been an "overemphasis" of power development compared with irrigation development on dual-purpose projects in the last few years. It was the progressive purpose, he said, that power development would bring about economic balance between industry and agriculture in a consequent enrichment of life in the West.

"Such an association as the National Reclamation Association cannot be a victim or a tool of any limited interest," Mr. Strauss said. "Because power happens to be a subject of political controversy, and thereby commands attention which some describe as "overemphasis," the cure for those concerned only with irrigation is not to seek to assail power, but to build up the emphasis on the benefits of irrigation. Don't be trapped by any pressure group that seeks to tell you that power development challenges the success of irrigation development. . . . In other words, I plead with this association if any section or segment of it loves the water twin more than the power twin, don't shoot one of the Siamese twins."

Mr. Strauss revealed further that comprehensive plans are in the making which, without prejudice to flood control or navigation, will bring about the wisest use of the waters of the Missouri River for irrigation, plus power generation. "The Missouri," Mr. Strauss said, "is the greatest stream left by nature on which the Bureau of Reclamation can still perform a major operation."

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City Seeks to Buy Madison Utility

Madison, Wis., Common Council has approved a resolution authorizing Mayor James R. Law, Harold E. Hanson, city attorney, and Martin P. Walsh, alderman, to confer with William G. Woolfolk, president of American Light & Traction Co., owner of Madison Gas & Electric Co., regarding a proposed plan of the city to purchase the utility. Under a utility purchase plan, involving an initial debt of from $10,000,000 to $12,000,000, the city could complete paying for the utility over a 25-year period at existing rates.

Under municipal ownership, it was said, the utility would yield net operating revenues, available for debt service requirements, of $1,065,000 annually, out of which interest and debt payments could be made. A price of $11,000,000 was recommended for the purchase.

Chile Plans Vast Power Program

A comprehensive and far-reaching project for the electrification of Chile, contemplating an investment of close to $100,000,000 over a period of 18 years, has been disclosed in a recent statement issued by the Corporation for the Development of Production, at Santiago, which will be responsible to a great extent for the financing of the project. The plan was reported in a special cable to the New York *Times* for October 26.

The project provides for the harnessing of the principal rivers of the country for the production of low-cost hydro-electric power down nearly the entire length of Chile's 2,600 miles, bordering the Pacific Ocean. That part of the plan which is in final form calls for initial production of about 600,000 kw. A study covering purchase in the United States of the required electrical equipment for the power project is understood to be well under way.

According to the announcement, progressive industrial development depends upon the mechanical power available and any program looking toward future completion of that development must take into consideration the reserves of low-priced coal. These reserves have been an important factor in Chile's past development, but may not be counted on indefinitely. "Chile," the statement said, "must have the energy to put in motion its economic resources."

The proposed financial set-up includes capitalization for the first stage of the project of 500,000,000 Chilean pesos ($20,000,000 U. S. currency), of which 450,000,000 pesos will be underwritten by the Corporation for the Development of Production. Expected investment up to 1957 is put at about 2,400,000,000 pesos ($96,000,000).

MEETINGS

Previously Listed

Pennsylvania Electric Association — Hydraulic power committee, Benjamin Franklin Hotel, Philadelphia, Pa., November 3; R. B. Horner, chairman, Duquesne Light Co., Pittsburgh, Pa. Systems operation committee, Roosevelt Hotel, Pittsburgh, Pa., November 4-5; E. W. Middleton, chairman, Pennsylvania Power & Light Co., Hazleton, Pa.

Pacific Coast Electrical Association — Wartime technical conference, northern section, San Francisco, Calif., November 4. Victor W. Hartley, managing director, 601 W. 5th St., Los Angeles, Calif.

American Society of Mechanical Engineers—Annual meeting, Pennsylvania Hotel, New York, N. Y., November 29-December 3. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

American Society of Agricultural Engineers—Fall meeting, LaSalle Hotel, Chicago, Ill., December 6-8. Raymond Olney, secretary, St. Joseph, Mich.

19th Exposition of Chemical Industries—Madison Square Garden, New York, N. Y., December 6-11. C. F. Roth, manager, Exposition of Chemical Industries, Grand Central Palace, New York, N. Y.

National Association of Manufacturers—2nd War Congress of American Industry, Waldorf Astoria Hotel, New York, N. Y., December 8-10. J. M. Boyd, secretary, 14 W. 49th Street, New York, N. Y.

American Standards Association — Annual meeting, New York, N. Y., December 10. P. G. Agnew, secretary, 29 West 39th Street, New York, N. Y.

Technical Valuation Society—Annual forum and business meeting, Building Trades Club, 2 Park Ave., New York, N. Y., December 11. W. C. Fisher, chairman, Room 516, 4 Irving Place, New York, N. Y.

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Permit Utility Repair Lighting During Blackout

Special lighting for the purpose of emergency inspection and repairs of public utilities during blackouts are authorized by the Eastern Defense Command in a letter addressed to offices of the Division of Civilian Protection.

"While the regulations permit certain lights of low intensity during periods of blackout," the letter said, "it is believed that these lights are inadequate for such tasks. It is deemed appropriate, therefore, that service commanders . . . permit special lighting for the purpose of emergency inspection and repairs immediately necessary to maintain or restore service on overhead and underground lines or main and outdoor station equipment of public utilities, including upward lighting as and when required, providing that the use of such lighting at night is reduced to an absolute minimum and, so far as practically possible, the lights beams be not directed upward."

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Kerville LCRA Purchase Fails in Election

A recent election to determine whether the city of Kerville, Texas, would take over the local facilities of the Lower Colorado River Authority at an agreed price of $412,000 failed to carry by 59 votes. The vote was 325 to 266.

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El Paso Bond Issue Loses

A revenue bond issue to provide funds for the purchase of the El Paso Electric Co. properties went down to defeat on October 23 by a vote of 2,475 to 651. El Paso Electric stock will now be distributed to stockholders of the Engineers Public Service Co., parent concern, if Securities and Exchange Commission approval is granted.

Week's Output Continues Rise

The output curve continued its record-breaking climb during the week ended October 23 to reach a new high in the industry's history. The amount of electrical energy distributed by the light and power business for the latest week totaled 4,415,405,000 kw.-hr., compared to 4,382,268,000 kw.-hr. the week previous, according to the Edison Electric Institute. Figures for the latest week compare with production of 3,752,571,000 kw.-hr. during the corresponding week a year ago, a rise of 17.7 percent.

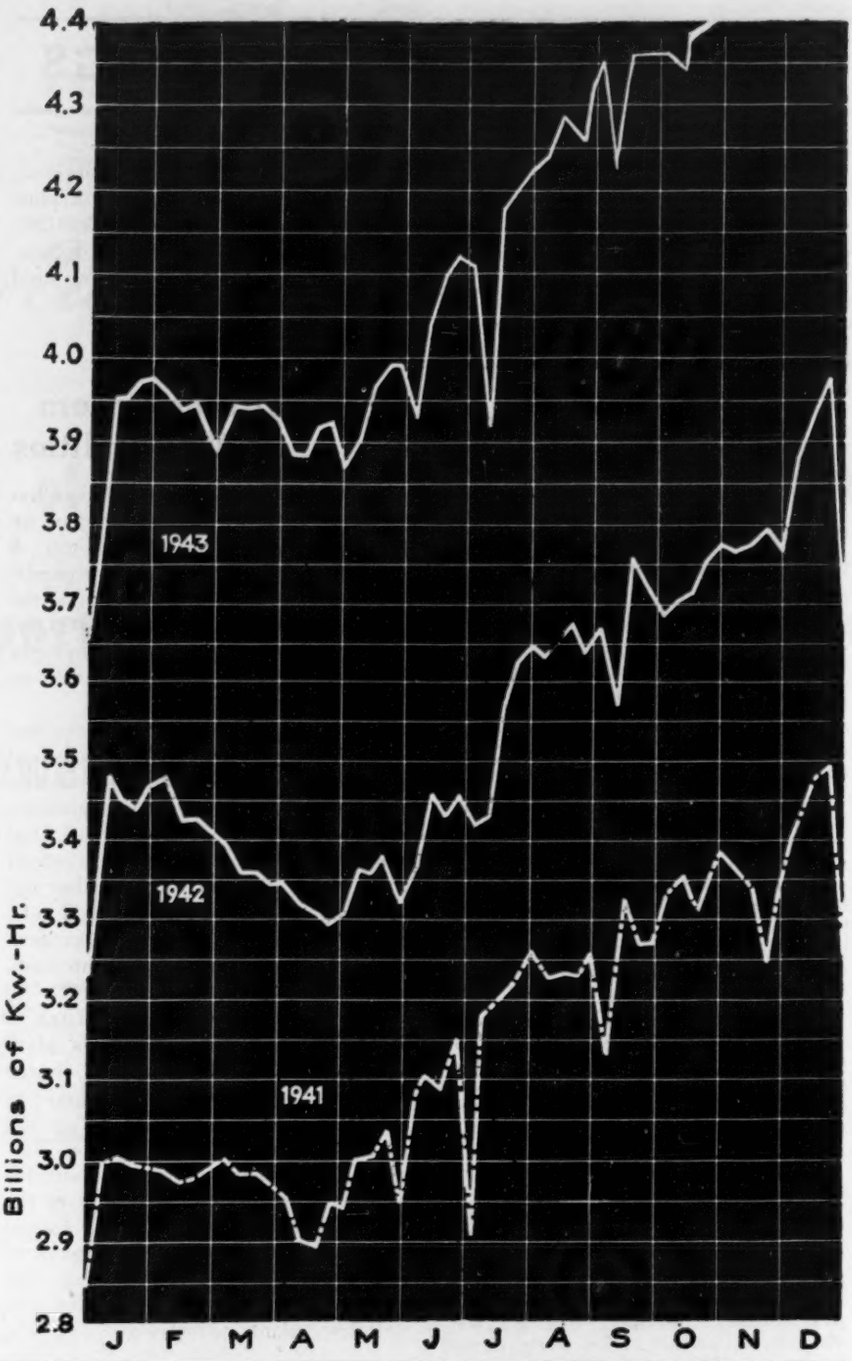
Three of the seven major geographic sections of the country contributed to the latest rise, compared with gains registered the previous week over the 1942 figures. They were the Mid-Atlantic region, which jumped from an 18.7 percent gain to a 19.7 percent; the Central Industrial region, which increased its lead from 14.4 percent the week previous to 15.5 percent for the latest week, and the West Central section, which went from 7.3 percent of gain to 9.2 percent. The Pacific Coast area, however, continued to lead the country with a 25.3 percent increase over the '42 week.

Weekly Output, Millions Kw.-Hr.

1943		1942		1941	
Oct. 23	4,415	Oct. 24	3,752	Oct. 25	3,341
Oct. 16	4,382	Oct. 17	3,717	Oct. 18	3,313
Oct. 9	4,342	Oct. 10	3,702	Oct. 11	3,355
Oct. 2	4,359	Oct. 3	3,683	Oct. 4	3,330
Sept. 25	4,360	Sept. 26	3,720	Sept. 27	3,273
Sept. 18	4,358	Sept. 19	3,757	Sept. 20	3,273
Sept. 11	4,229	Sept. 12	3,583	Sept. 13	3,322
Sept. 4	4,351	Sept. 5	3,673	Sept. 6	3,133
Aug. 28	4,322	Aug. 29	3,640	Aug. 30	3,261
Aug. 21	4,265	Aug. 22	3,674	Aug. 23	3,231

Percent Change from Previous Year

	Week Ending		
	Oct. 23	Oct. 16	Oct. 9
New England	+ 7.0	+ 8.9	+ 8.0
Mid-Atlantic	+19.7	+18.7	+19.7
Central Industrial	+15.2	+14.4	+13.9
West Central	+ 9.2	+ 7.3	+ 6.9
Southern States	+19.7	+22.2	+20.8
Rocky Mountain	+14.7	+14.9	+15.1
Pacific Coast	+25.3	+26.6	+24.5
Total United States	+17.7	+17.9	+17.3



Diversion Ups Lake Power Potential

Diversion of the Ogoki River and Long Lake in northern Ontario into Lake Superior increased the electric power potential of the Great Lakes-St. Lawrence waterways system by 360,000 hp., Dr. Thomas Hogg, chairman of the Hydro-Electric Power Commission of Ontario, said in an address at Fort William, Ontario.

Speaking to a meeting of District No. 3 of the Ontario Municipal Electric Association, Dr. Hogg said that two diversions added 5,000 cubic-feet a second to the flow of water in the Great Lakes and made possible the development of an additional 110,000 hp. in the Lake Superior area and 250,000 hp. below Lake Superior.

Diversion of the Ogoki River into Lake Nipigon, whence it flows into Lake Superior, would make it possible to provide an increase of 90,000 continuous horsepower from developed and undeveloped power sites on the Nipigon River. Another 20,000 hp. could be developed on the Aquasabon River, through which the waters of Long Lake flow into Lake Superior at the rate of 1,000 cubic-feet a second, Dr. Hogg said.

PUC Opposes OPA Rate Case Appeal

The District of Columbia Public Utilities Commission has filed a brief with the U. S. Supreme Court opposing the appeal by the Office of Price Administration which seeks reversal of an appeals court decision upholding a Public Utilities Commission grant of a rate increase to the Washington Gas Light Company.

OPA appealed the Circuit Court's decision last month asking disestablishment of the sliding-scale agreement covering capital utilities.

SEC DECISIONS-HEARINGS

The Securities and Exchange Commission, in a series of orders issued last week affecting electric utility companies:

DENIED AN APPLICATION filed by the Central Hudson Gas & Electric Corp. for an order declaring it not to be a subsidiary of United Corp. The SEC opinion declared that Niagara Hudson Power Corp., statutory subsidiary of United Corp., owns 445,783 shares, or 29.72 percent, of Central Hudson's outstanding common stock in which voting power is vested. "The fact that United does not own directly any of the outstanding securities of Central Hudson is of no consequence with respect to the application before us," the opinion said.

Applications Filed

ILLINOIS IOWA POWER CO., in the North American Co. system, filed a registration statement covering a proposed issue of $65,000,000 first mortgage collateral trust bonds, series 1973, and a plan to negotiate bank loans of between $4,000,000 and $5,000,000. The new bonds and bank loans would be used to refund $73,196,022 of two series of bonds outstanding.

JOINT APPLICATION HAS BEEN FILED by Eastern Utilities Associates and its subsidiary, Blackstone Valley Gas & Electric Co., proposing the issuance and sale to the public of $11,300,000 principal amount of first mortgage bonds. Blackstone proposes to use the net proceeds, together with treasury funds, to redeem on December 1 a like amount of its bonds now outstanding, which constitute all its funded debt.

NOVEMBER 4 WAS SET as the late date on which the commission will entertain requests for a hearing in the proposal of Columbia Gas & Electric Corp. to make a capital contribution of $414,000 to its subsidiary Union Light, Heat & Power Co.

Hearings Scheduled

NOVEMBER 4: Hearing on proposal of Southern Colorado Power Co., subsidiary of Standard Power & Light Corp., to refund and redeem $6,763,400 principal amount of its first mortgage gold bonds, series A, 6 percent, due 1947. The company proposes to do this by issuing $5,500,000 principal amount of first mortgage gold bonds, due 1968, and $1,200,000 principal amount of its serial notes, together with funds in its treasury. The proposal complies with a commission order, dated August 23, 1943, which made the refunding of the company's presently outstanding bonds a condition precedent to the consummation of a proposed plan of recapitalization.

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Niagara Falls Power Files With Supreme Court

Niagara Falls Power Co. last week filed a petition with the U. S. Supreme Court for a writ of certiorari to review the judgment of the Court of Appeals, dated October 4, requiring the company to remove from its fixed capital accounts and charge to earned surplus, the sum of approximately $15,500,000, designated by the Federal Power Commission as "write-ups" in the original cost of its electric plant.

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FPC Reaffirms Orders on Two Utilities

The Federal Power Commission has denied in part and granted in part an application filed by Utah Power & Light Co. with respect to the commission's order of August 2 directing the company to dispose of over $27,000,000 in "write-ups" and "other improper charges" to the company's plant accounts.

Last week's order reaffirms the earlier order in respect to the disposition of the "write-up" of $26,434,849, stating that the company's application presents no new questions of fact or law, but adds that: "It is appropriate to afford Utah Power & Light Co. a further opportunity to present material and relevant evidence bearing on the classification and disposition of the intercompany profits of $1,026,882."

The original order required Utah to dispose of the "write-up" in its plant accounts of $26,434,849 by a charge to "account 271 (earned surplus), or if created for such purpose, all or any part, to account 271 (capital surplus)," provided such capital surplus is created within six months from the date of service of said order of August 2. It further required the company to classify $1,026,882, representing "intercompany profits" in account 107 (electric plant adjustments) and to dispose of that amount by a charge to account 271 (earned surplus).

Mississippi Power Case

In a similar action, the FPC denied in part and granted in part an application for rehearing filed by Mississippi Power & Light Co. with respect to the commission's order, also dated August 2, directing the company to dispose of over $13,000,000 in "write-ups" and other amounts representing excess over original cost, and to complete and file within four months revised classification and original cost studies with respect to over $21,000,000 remaining in other accounts on the company's books.

Last week's order reaffirms the August 2 order in respect to the classification and disposition of $6,352,203 of the $12,396,371 which the company was directed to classify in account 107. The order requires disposition of additional amounts in account 107 aggregating $2,559,967, making a total of $8,912,170 in account 107 to be disposed of immediately. It is appropriate, however, the FPC said, to afford Mississippi a further opportunity to present evidence bearing on the classification and disposition of $4,200,000, $952,097 of which the August order directed be classified in account 100.5 (electric plant acquisition adjustments) and the remainder in account 107, but which the company contends may all be properly classified in account 100.5.

The order also denies the company's application for a rehearing concerning the completion and filing of revised classification and original cost studies as to the balance, adjusted in accordance with the provisions of last week's order, of its recorded book costs of $21,523,075, and reaffirms that these revised studies must be filed with the commission by December 1.

•

York Files $4,500,000 Bond Issue with SEC

The York Corp., York, Pa., has registered with the Securities and Exchange Commission $4,500,000 of first mortgage sinking fund bonds due in 1958. Bonds will be considered a "direct first lien on substantially all the manufacturing properties, warehousing and sales branches owned by the company," according to the corporation's counsel.

Net proceeds from the sale of the bonds will be applied to the redemption on or before April 1, 1944, at 101 percent of principal amount of $3,913,000 of first mortgage 6 percent sinking fund gold bonds, due October 1, 1947, and to the payment at 100 percent of face amount of $378,550 of other notes

Utility Reports

	Net Income 1943	1942
‡American & Foreign Power and subs	$7,757,485	$6,065,110
*Central Hudson Gas & Elec.	1,517,807	1,488,981
*Central Maine Power	3,385,788	3,319,014
*Detroit Edison and subs.	8,428,635	8,998,263
‡Electric Bond & Share and subs	5,621,374	6,820,037
†Electric Power & Light and subs	9,224,361	8,019,544
*Houston Ltg. & Power	3,228,642	2,521,698
‡Metropolitan Edison	4,132,740	3,105,804
†Mountain States Power	,697,300	637,379
*Public Service N. H.	1,352,059	1,457,295
†San Diego Gas & Elec.	1,566,276	1,538,914
*Tampa Electric	1,181,920	1,136,870

*Twelve months ended September 30.
†Twelve months ended August 31.
‡Twelve months ended June 30.

A Texas Utility President Says:

"I am in favor of your program and will boost it at every opportunity. It is a practical step to lower investment costs."

THAT'S a typical comment on General Electric's recent proposal to push ahead with the simplification and standardization of electric apparatus such as large power transformers, unit substations, switchgear, etc.

Along with many other statements in similar vein, it helps to confirm our opinion that the *next big step forward to lower costs will be found in the economies of repetitive manufacture of heavy electric apparatus.*

Behind this forecast is our experience in supplying "ready-made" unit substations, metal-clad switchgear and the like at lower and lower prices, as compared with those of "tailor-made" designs. Wartime experience in the large-scale manufacture of G-E turbines for ships is additional confirming evidence.

In the final analysis, the decision to buy standard designs and ratings of heavy apparatus must rest with you and your engineers. That is why we ask your foresighted consideration of this important question. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

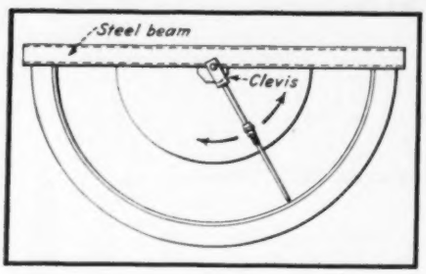
201-102-170

The best investment in the world is in this country's future — BUY WAR BONDS

HOW DESIGN... CONSTRUCT OPERATE MAINTAIN

Metallizing Kills Turbine Tip Losses

Application of a spray metal coating to a turbine cylinder proves that steam capacity tied up in turbine blade tip losses caused by erosion of cylinder bore can be released by spray metallizing. Method proves an escape from economy losses and mechanical damage to machine pending peacetime opportunity to make permanent repairs. Spray coating eroded surfaces with corrosion resistant metal serves as a retardant to wasting away of metal and thus destroying clearances essential to realizing maximum capacity from generating equipment.



SWINGING micrometer depth gauge preset to desired cylinder bore and swung from bar guides application of spray metal to eroded surface

Moisture in the steam in the lower-pressure stages of a 25,000-kw. turbine at the plant of a middle western company had, over a period of fifteen years, eroded the cast-iron cylinder bore 0.030–0.040 in. This increase in the turbine blade tip clearance introduced losses due to turbulence and steam by-passing the turbine blade tips. These losses, which become a significant and measurable amount in older machines, were eliminated by restoring these clearances to original design values.

Narrow confines of the working space, at the root of the stationary blading, added to the difficulty of the repair job. Surface of the base metal was prepared by carefully and thoroughly sandblasting, using a long nozzle to reach the confined surface. Care must be taken to shield the adjacent blading from action of the sandblast and light sheet metal "masks" were used for this protection. These masks were similarly useful when spray coating.

Since it would be difficult and expensive to remove surplus metal if sufficient were added to cut turbine blade clearance below allowable limits, the metallizing operation must be conducted with special care. Further, the eroded surface is not uniform and erosion depth may vary, as in this instance, from 0.010 inch to 0.040 in.

To apply the metal (18–8 stainless) to the surface and maintain uniformity of the bore with no "high spots" the sprayed metal was added in successive layers, checking the clearance repeatedly with an improvised swinging micrometer depth gauge.

Thus, by repeated cycles of metal application and measurement, the eroded areas of the blade ring bore were restored to original dimensions. Upon returning the machine to operation, tip losses were found to approximate the losses of a new machine.

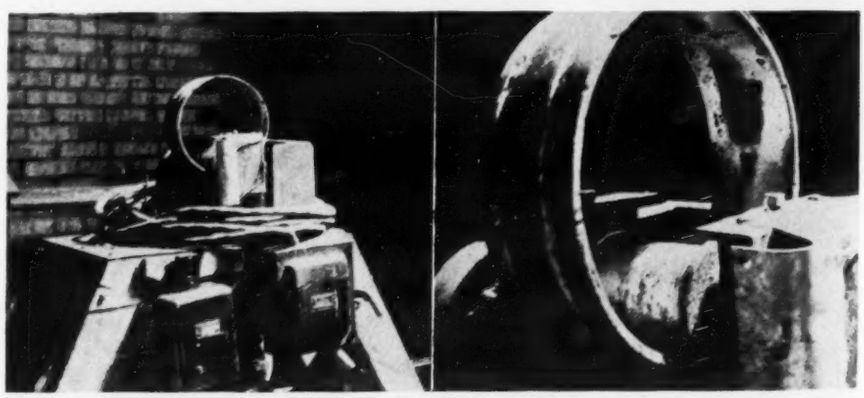
•

Simple Wire Stripper

A wire stripper to all appearances very simple has been designed and built by the Utah Power & Light Company, Salt Lake City. It takes from No. 8 to No. 0000 wire.

Two rolls driven by electric motor are separated sufficiently to take a steel ring about 10 in. in diameter by 3 in. wide which travels continuously between them. In the outer circumference of the ring are two grooves for accommodating larger and smaller sizes of wire. In operation, the wire is fed through one of the grooves and is pinched so that the insulation comes off clean without injuring the wire.

The wire is fed in from a take-off reel and goes from there to the take-up reel on the line truck.



SIMPLE WIRE STRIPPER made by the Utah Power & Light Company (left). Close-up, showing grooved ring that travels between the rolls (right)

SAVING COPPER HERE

MEANS MORE SHELLS HERE

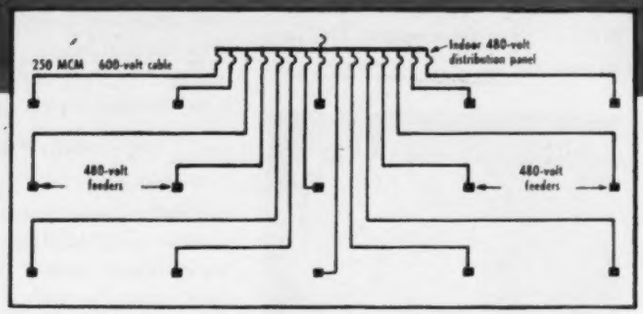
Load-center distribution makes that saving possible

Using load-center unit substations, you can install a complete, co-ordinated power system that requires far less copper and other vital material than you'd need for an old-style system with "piecemeal" substations.

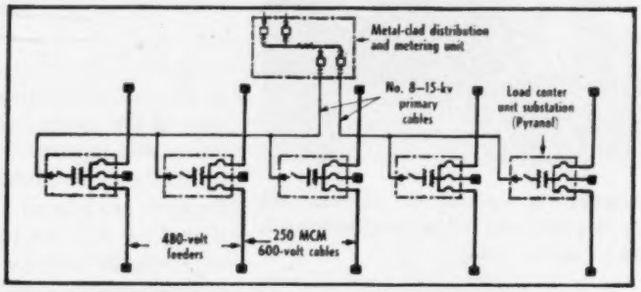
One recent installation saved 39,500 pounds of copper—enough to make 1,500,000 small shell casings. (At the right are diagrams of typical medium-size systems to show how this is possible.) On large installations, many times this amount can be saved.

Factory-built, safety-enclosed unit substations, which make load-center distribution possible, are designed for serving loads of 600 volts and below from incoming lines up to 13.2 kv. They are delivered ready to install right in the same room with the machinery to be supplied with power. You can add substation capacity *where* you need it, *when* you want it, largely eliminating the high cost of long, heavy, low-voltage circuits from a distant substation.

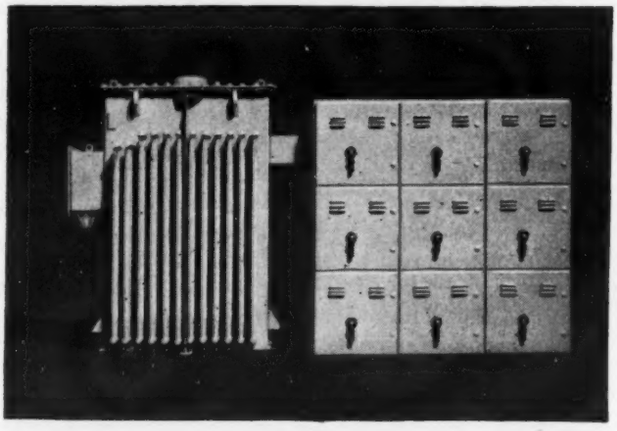
G-E unit substations, installed on the load-center plan, eliminate troublesome voltage drop, and improve the performance of your electric equipment. Load-center distribution is economical, both in its use of critical materials and in its over-all cost. It is the most reliable, flexible, and time-saving method yet devised for industrial power distribution. More information in our bulletin, No. GEA-3592. *General Electric Company, Schenectady, N. Y.*



OLD-STYLE SYSTEM. Critical materials—95,000 pounds. Note the long, heavy, secondary-cable runs to feed the fifteen load centers. And the capacity of this system can not be increased easily.


Metal-clad distribution and metering unit
No. 8–15-kv primary cables
Load center unit substation (Pyranol)
480-volt feeders
250 MCM 600-volt cables

LOAD-CENTER SYSTEM. Critical materials—74,500 pounds. This system requires 10 tons less critical materials than the one above, and saves more than 20 per cent of the cost. Capacity can be increased easily to handle new loads, or to meet shifting load conditions.



→ **Load-center unit substations can be installed on overhead platforms, over washrooms, or between column centers, etc. to save space. Their infrequent need for inspection and maintenance saves you many valuable hours of maintenance time.**

UNIT SUBSTATIONS

BUY WAR BONDS

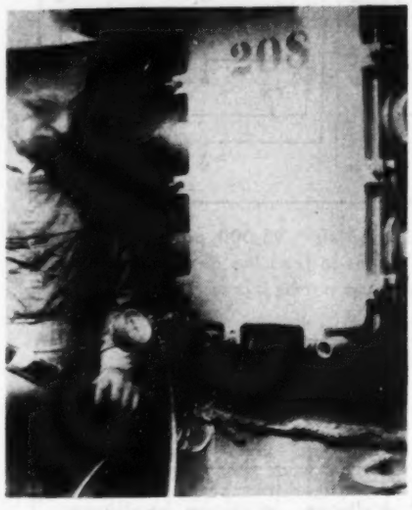
GENERAL ELECTRIC

Bicycle Pump Pressure Tests Junction Box

By C. R. MACHEN
Pacific Gas & Electric Company, Oakland, Calif.

It has become common practice to apply pressure tests to underground junction boxes, transformers, cutouts, etc., to test the wiping to make sure that it is waterproof. In the larger divisions of this company cable trucks are equipped with compressor and tank for this purpose. However, all divisions of this company and many utilities throughout the country do not have such a handy piece of equipment.

In that case an ordinary bicycle pump with 0-15-lb. pressure gage and necessary fitting to attach to the box will do the job quite nicely. The box is pumped up to 5-lb. pressure and



PRESSURE is applied to junction box with bicycle pump while soap solution is used to detect leaks

left for 15 minutes while a soap solution is applied to the cover, wiping nipples and other points to detect leaks. Each cover, not already provided with plug, is drilled and tapped in the lower right-hand corner for a $\frac{1}{4}$x$\frac{1}{8}$-in. brass bushing.

This practice has not completely eliminated water difficulties, but has minimized trouble from leaks to a very large extent. In one section of Oakland manholes almost completely fill with water in the winter and considerable trouble has resulted. A year ago the pressure test was used to eliminate all leaks and the system went through the entire winter without a single case of trouble. Moreover, cable splicers are more careful with their wiping because of the tests.

This idea received a special award in the 1942 suggestion contest of the company's research committee under the chairmanship of W. G. Vincent, vice-president and executive engineer.

•

Transformer Cooling System Maintenance

By S. BENNON
Transformer Engineer,
Westinghouse Electric & Manufacturing Co., Sharon, Pa.

For the three different types of cooling used on power transformers each has a maintenance problem; the transformers having oil-immersed cores and windings, utilizing natural and artificial methods of cooling and accordingly being designated as self-cooled, self-cooled air-blast, and water-cooled types.

Self-cooled Transformers

Ventilation — Self-cooled oil-immersed transformers depend entirely on the surrounding air for carrying away their heat. For this reason care must be taken to provide adequate ventilating facilities. Self-cooled transformers should always be well separated from one another and from adjacent walls and partitions in order to permit free circulation of the air. In the average case the separation should not be less than 24 to 36 in., depending upon the contour of the space or cell in which the units will operate. For indoor installation the room in which the transformers are placed must be well ventilated so that the heated air can escape readily and be replaced by cool air from the outside. The recommended maximum operating ambient temperature limit is 30 C.

Radiators—Care should be taken to have both valves of each radiator completely open. A check may be made by feeling the individual radiators. Any radiator considerably cooler than the rest would indicate a closed or partially closed valve. All radiator leaks should be repaired promptly by welding or calking. Information concerning special accessories for removing radiators from transformer tanks and for removing rust spots on radiator surfaces may be obtained from manufacturer.

Self-Cooled Air-Blast Transformers

Air-Blast Control—The thermostat control element is shipped with the adjustment set to place the fans in operation when the oil temperature reaches approximately 60 C. or 65 C. There are two variable factors which can be adjusted. The first is the oil temperature at which the contacts close and the second is the drop or differential below this temperature at which the contacts open. The setting of these adjustments will depend on the nature of the transformer loading. With extreme changes in ambient it may be found necessary to change the operating point to compensate for these changes. If it is found that the fans start and stop frequently or tend to "chatter" the differential should be increased.

Fan Motors—Fan motors should be greased periodically. The more recent fan motors require much less greasing than the type used earlier. Excessive greasing must be avoided to prevent the greases from being forced into the motor. The fan motor housings should be painted with the same frequency as the main transformer.

Where bolted-on assemblies are used, these should be checked periodically for tightness.

Water-Cooled Transformers

Cooling Coils—SCALE, DIRT AND SLUDGE—Occasionally the quality of the water used for cooling purposes is such that it will gradually form a deposit inside the cooling coils. This will tend to increase the transformer operating temperature either by restricting the flow of water or by increasing the temperature drop between the hot oil and the cooling water. Even a relatively thin layer of scale can greatly increase the temperature drop between the water and the oil. A higher operating temperature of the transformer or restricted flow of cooling water should therefore call for a check of the cooling coils. If the trouble is caused by a deposit of dirt it can be removed by blowing through the coil with live steam. If there is a deposit of scale it can usually be removed by passing a 10 percent solution of hydrochloric acid through the coils.

In cases where there is appreciable sludging of the oil a deposit of sludge is often formed on the outside of the cooling coils. Here again this results in higher operating temperatures and the sludge should be removed, preferably by washing with hot oil.

It is essential in a water-cooled

BEFORE BUYING A TRANSFORMER

ASK YOURSELF THESE QUESTIONS

1 Can the transformer be installed indoors, at the d center, where voltage op would be reduced and pper saved?

2 Will an indoor installation require an expensive e-proof vault or fire wall?

3 Does the surrounding air contain impurities ich might adversely affect nsformer reliability and e?

4 Can lightning surges and switching transients ch the transformer, either ect or through the main pply transformer?

5 In a plant rearrangement later, is it likely at the transformer will be ved outdoors, or to some er indoor location?

6 How much maintenance will be required?

7 In an emergency, will the transformer handle tained overloads?

8 Is there any chance that the transformer will etime be partially or y submerged in water?

Reg. U.S. Pat. Off.

GET THE RIGHT ANSWER WITH PYRANOL TRANSFORMERS

1 You can ***safely*** install Pyranol* transformers indoors. Never has one burned or contributed to a fire.

2 No vaults are required with Pyranol transformers. You can install them anywhere (even on the roof, in the basement, or on overhead beams), thus saving time, floor space, and construction materials.

3 Pressure-tight tanks protect the vital parts of Pyranol transformers from dust, dirt, fumes, dampness, and accidental damage.

4 Pyranol transformers have high impulse strength against voltage surges—permitting dependable protection by valve-type arresters.

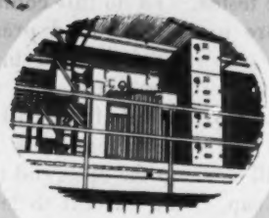
5 The completely sealed tanks of Pyranol transformers make any future change to an ***outdoor*** installation "a natural." Their inherent safety makes it possible to relocate them ***indoors*** anytime, anywhere.

6 Because dust, dirt, and moisture can't get into a Pyranol transformer, and since Pyranol is nonoxidizing and nonsludging, little or no maintenance is necessary.

7 The heat-storage capacity of the core-and-coils and of the cooling liquid make the Pyranol transformer ideal for sustained emergency overloads.

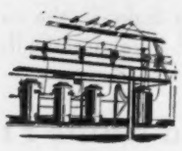
8 Pyranol transformers are pressure-tight. Even after three days' submersion in a torpedoed tanker, Pyranol transformers were found unharmed.

ON THE FACTORY FLOOR



ON OVERHEAD BEAMS

ON ROOF TOPS



IN MINES

ALL-PURPOSE

PYRANOL TRANSFORMERS

For further information ask your G-E representative, or write for Bulletin GES-2974. *General Electric Company, Schenectady, N. Y.*

BUY WAR BONDS

GENERAL ELECTRIC

402-61-5100

transformer that the water be kept flowing continuously. Alarm circuits should be wired to indicate when the flow of water drops below the value given on the instruction plate. When parallel sections of cooling coils are used in the same transformer care must be taken that each section receives its share of the cooling water. Salt or highly acid water must never be used in cooling coils.

Leaks—If there is any suspicion of a leak in the cooling unit it should be tested. To do this connect a pressure pump valve and pressure gage to one end of the coil in the order given. Pump water into the coil or transformer oil if the coil is already in the transformer tank and when full close up the open end tightly with a cap, being careful to leave no air pocket. Bring the pressure up to about 100 or 150 psi. by means of the pump and close the valve tightly. If all connections are tight and there are no leaks in the coil the pressure should hold practically constant.

•

Load Shifts Free Line for War Load

Accompanying "before" and "after" diagrams illustrate graphically one of the many instances in which a utility system has been rearranged through careful and imaginative engineering, to accommodate war demands for power without resorting to the needless expenditure of vital and critical materials.

They concern an instance in which the Cincinnati Gas & Electric Company juggled loads among four parallel 13.2-kv. sub-transmission lines, within the past year, to free a circuit of all load and thus provide sufficient line capacity, through reinsulation for 66 kv., to serve a new 25,000-kw. war load, without purchasing new conductors.

Feeder Loads Shifted

The rearrangement involved four 13.2-kv. feeders (2021, 7423, 2022 and 2521) leaving one of the Cincinnati generating stations. Two of these feeders were underground and two overhead, but all four were only partially loaded. Feeder 2021 ran south 2½ miles out of the generating station, whence another nearby 13.2-kv. line, tying two substations, extended about a mile over the route to be followed to the war plant. Study of feeder loads showed that all the load on one of the overhead circuits (2021) could be shifted to the other feeders, freeing it to serve the new load. Elimination of the substation tie circuit mentioned would supply conductors to complete the balance of the required line.

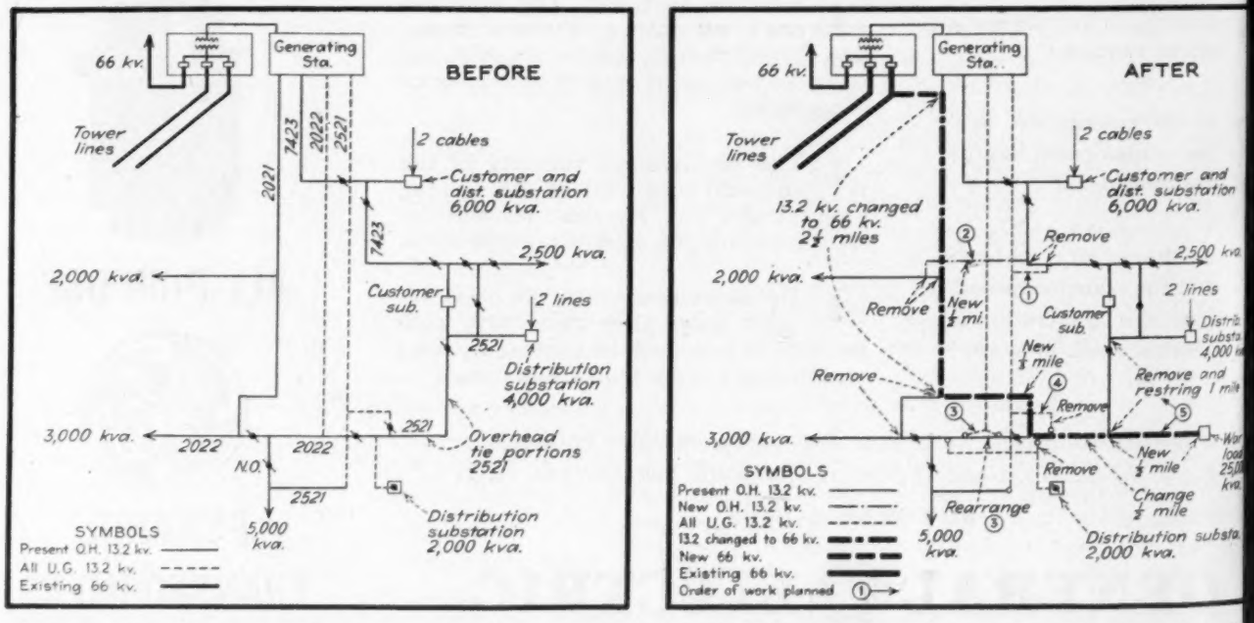
Bulk of the load on overhead feeder 7423 was transferred to one of the underground circuits (2521), permitting 7423 to assume the branch line load of 2021. This left circuit 2021 free from the generating station to a point 2½ miles south. The load on the overhead tie line portion of feeder 2521 was transferred to 2022, freeing it for connection with 2021 over about ⅛ of a mile of line b from conductor freed by other tr fers. This connection of 2021 2521 provided all but about ⅛ m of the required war circuit load fr the tie circuit portion of 2521 also freed a mile of copper which w removed and used to extend the cuit the remaining ½ mile to the w plant. These were the major chan made; minor changes are indicat on the accompanying diagrams.

Copper on the first 2½ miles circuit 2021, which was converted 66 kv., was No. 4/0, the balance fr this point to the war plant was N 2/0 copper. Maximum capacity the 13.2-kv. circuit released was e mated at about 7,000 kw., but wh converted to 66 kv. its capacity w estimated to be 35,000 kw., or well excess of the contemplated load.

Configuration Changed

In reinsulating the circuit for kv. the 13.2-kv. flat construction w changed to 66-kv. triangular confi uration and all existing poles we replaced with poles 10-15 ft. high Minimum pole height on the "ne line was 50 ft.; maximum, 70 ft.

The net effect of the shifting loads among the four circuits w to bring the loading on undergrou feeder circuits 2022 and 2521 nea to full load capacity at the sacrifi of one tie line between two distri tion substations. All copper remov from stock to make the load transf and circuit interconnections indicat was fully replaced by conductor tak down during the rearrangement.



"BEFORE" AND "AFTER" circuit diagrams show how rearrangement of 13.2-kv. feeders freed circuit to supply war industry l

How One Power Company Got Another 100 Kw from an Overloaded Feeder for a New Airport

ROBLEM. A small airport in the South needed 2300-volt ervice, the total estimated peak demand being 100 kw. The ower company that serves the area had a 2300-volt distribution eeder, but it was already loaded to the point of causing trouble. his feeder originated at a substation on an 11-kv circuit at a oint about 15 miles from the generator.

OLUTION INCLUDED USE OF INDUCTION REGULATORS. In order carry the new airfield load, the company extended the 11-kv eder about 4¼ miles, to a point where the 2.3-kv feeder anched and continued in two directions. At this point, three -E 75-kva transformers and *TWO G-E 12-KVA 2400-VOLT NDUCTION REGULATORS* were installed. The regulators t only made it possible to supply the airfield with the power quired, but also improved voltage conditions on the two 2300-lt branch lines.

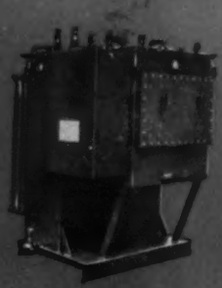
SAVINGS IN MATERIAL AND TIME

Improvement in regulation was needed because of the small conductors installed in this area. If regulators had not been used, it would have been necessary to extend the 11-kv feeder all the way to the airfield—by changing over a considerable portion of 2300-volt line to 11 kv. This alternative would have required a much greater expenditure of the critical materials so sorely needed for other war needs. Also, the ready availability of G-E feeder regulators and their ease of installation made the use of regulators the quickest method of doing the job.

If you need additional capacity, ask your G-E representative to estimate the savings in time and critical materials that can be obtained on your feeders with G-E feeder regulators, or write for Bulletin GEA-2730. *General Electric Company, Schenectady, N.Y.*

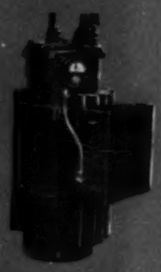
BUY WAR BONDS

One of a series telling of wartime distribution problems being solved with G-E feeder regulators—applications where they saved critical materials or otherwise helped the war effort, like some jobs you may have.

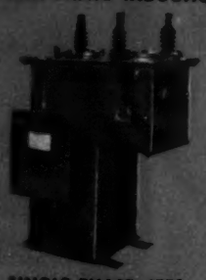


THREE-PHASE STEP

SINGLE-PHASE INDUCTION



SINGLE-PHASE INDUCTION



SINGLE-PHASE STEP

DRY-TYPE INDUCTION

GENERAL ELECTRIC

404-32-5400

FEEDER REGULATORS

HOW TO DETERMINE RESISTANCES OF PARALLEL CIRCUITS

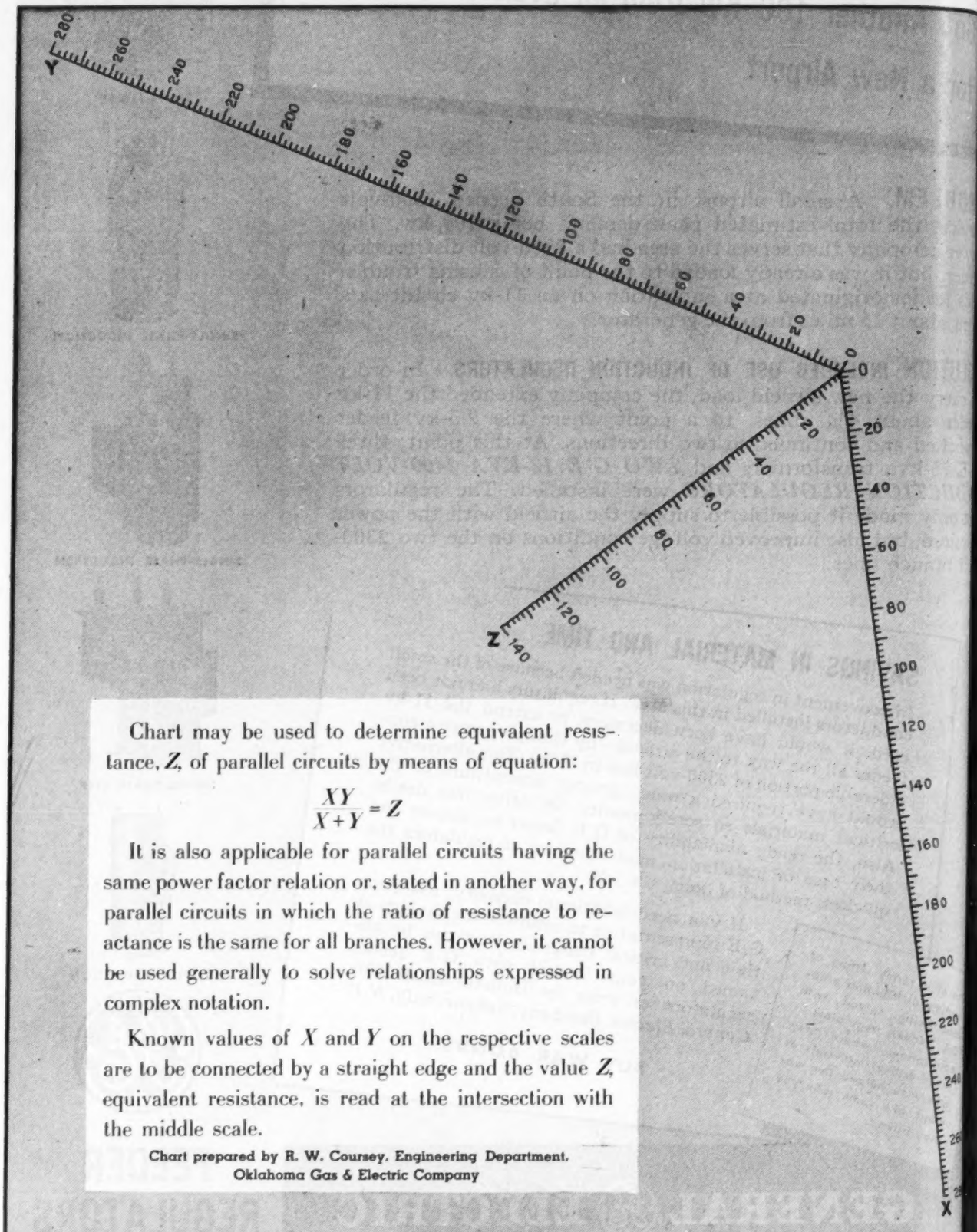


Chart may be used to determine equivalent resistance, Z, of parallel circuits by means of equation:

$$\frac{XY}{X+Y} = Z$$

It is also applicable for parallel circuits having the same power factor relation or, stated in another way, for parallel circuits in which the ratio of resistance to reactance is the same for all branches. However, it cannot be used generally to solve relationships expressed in complex notation.

Known values of X and Y on the respective scales are to be connected by a straight edge and the value Z, equivalent resistance, is read at the intersection with the middle scale.

Chart prepared by R. W. Coursey, Engineering Department, Oklahoma Gas & Electric Company

For Efficient Fluorescent Lamp Maintenance

THE

"Watch Dog"

NEW G-E STARTER

With Rated Long Life

Use the "Watch Dog" to guard fluorescent lighting everywhere. This new manual reset starter for 40-watt lamps will help prolong lamp life and starter life. It will help save maintenance time. Moreover, the G-E "Watch Dog" starter has an average rated life of three years under specified test conditions.

The "Watch Dog" provides precision lamp starting. It locks out dead lamps quickly and positively thereby eliminating blinking. In addition, the G-E "Watch Dog" starter enables a dead lamp to be removed immediately. No cooling period is required. It is reset easily, to guard a new lamp, simply by pressing a button.

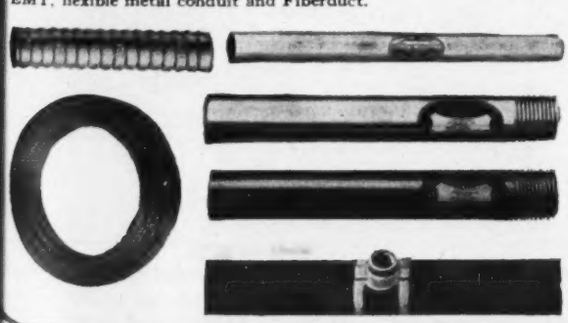
GENERAL ELECTRIC FUSES

G-E fuses provide reliable overload and short circuit protection for all electrical circuits. G-E nonrenewable enclosed fuses, G-E renewable enclosed fuses, G-E Silvend fuses with silver-plated contacts—all are available rated up to 600 amp., 250 V. or 600 V. These are the fuses General Electric uses to protect its own circuits.

FOR FURTHER INFORMATION about G-E "Watch Dog" fluorescent starters, fuses, wires and cables and conduits, see the nearest G-E Merchandise Distributor or write to Section CDW-1035-9, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

G-E BUILDING WIRES AND CONDUITS

There are various different G-E building wires available for war work including Type SN small diameter thermo-plastic insulated. G-E conduits include G-E White and G-E Black rigid conduits, EMT, flexible metal conduit and Fiberduct.



GENERAL ELECTRIC

Electric Trap Keeps Eels Out of Turbine

By H. C. AKINS
Superintendent, E. J. West Station,
New York Power & Light Corporation

Much has been written about the mysteries of the life cycle of eels, their spawning, growth and migration. At one of our hydro stations we were more or less forced through necessity to have an interest in one phase of that life cycle, namely, migration.

Apparently stimulated by certain conditions which included cool fall weather and muddy water following heavy rains, they felt the urge and started for the sea, and thereby hangs the tale.

En route many passed through the forebay racks and into our turbines. There they were cut, sliced and shredded, smelled to high heaven and so unbalanced the unit that it would pound all the packing out of the packing glands in short order. The only remedy then was to shut down, unwater the unit, remove the eels and install new packing. Aside from being a very disagreeable job, it also meant a unit outage of several hours each time, which when multiplied by the possible 50 or 60 shut downs each fall became an item of some magnitude. After considerable experimentation, we installed a barrier (Fig. 1) on a scheme which, though extremely simple, has done the job so efficiently that for two seasons after its installation there were still no shutdowns due to eels.

A current is set up through the water from the electrodes (Fig. 2) to the bottom and sides of the canal. Our intake canal in this case was about 34 ft. wide. We found that a 660-watt heater element in the lamp sockets permitted enough current during the light eel runs to keep them up-stream. However, during the heavy runs it was found necessary to use another 500 watts of loading to prevent some of the larger ones from crowding through.

For larger installations the scheme as shown in Fig. 2b is suggested, as it offers the advantage of current flow between electrodes as well as between electrodes and ground.

Our observations indicate that the eels have readily found another path, by-passing the station, where the travel is much less rough than it would be through our turbines.

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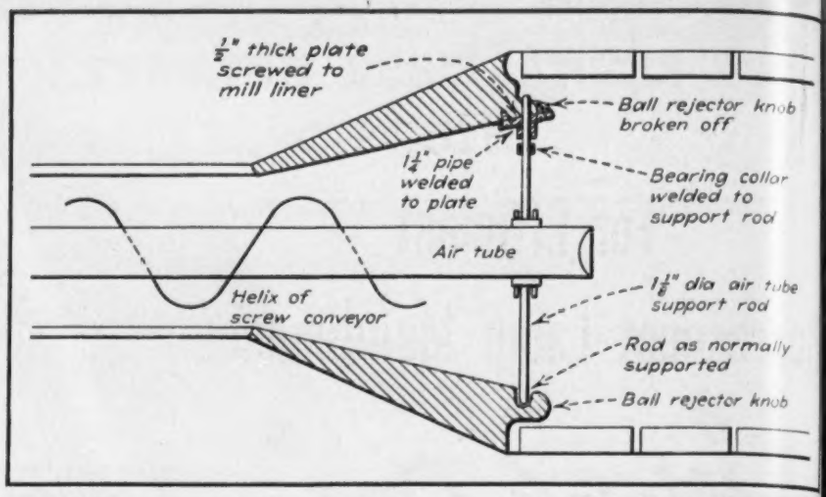

½" thick plate screwed to mill liner
Ball rejector knob broken off
1¼" pipe welded to plate
Bearing collar welded to support rod
Air tube
1⅛" dia air tube support rod
Helix of screw conveyor
Rod as normally supported
Ball rejector knob

IMPROVISED support collar for the air tube support rod keeps ball mill operating until replacement arrives

Repair Sustains Ball Mill 5 Months

Detailed in the accompanying drawing is a method of repair used at Ohio River station of the Southern Indiana Gas & Electric Company, Evansville, to keep a ball-type coal pulverizing mill in operation for five months until a replacement could be obtained for a damaged mill liner.

Combined action of coal and balls in this mill had worn away and broken one of the ball rejectors on the mill liner, allowing one of the rods of the spider supporting the rotating air tube to drop out of line. The air tube in this particular type mill forms the axis of the screw conveyor that delivers coal to the interior of the mill. Failure of the air tube support spider distorted the screw conveyor enough to prevent it from turning and thus put the mill out of operation.

As shown, the repair was made by screwing a ½-in. plate over the worn mill liner. This plate was provided with an integral collar—made from 1½-in. pipe—which bore against a similar collar welded to the air tube support rod, thus preventing it from dropping out of line and crippling the mill.

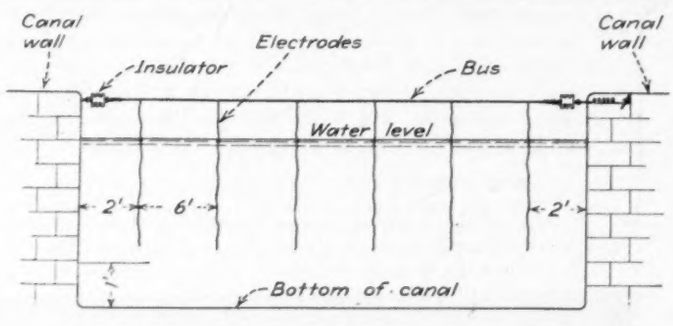


FIG. 1

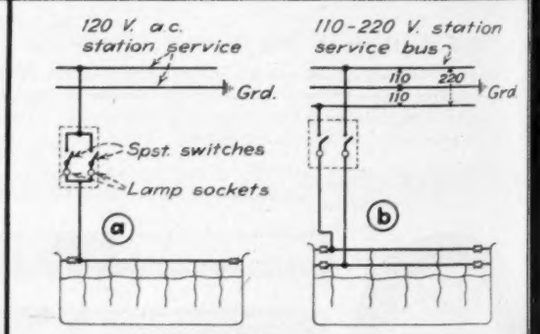
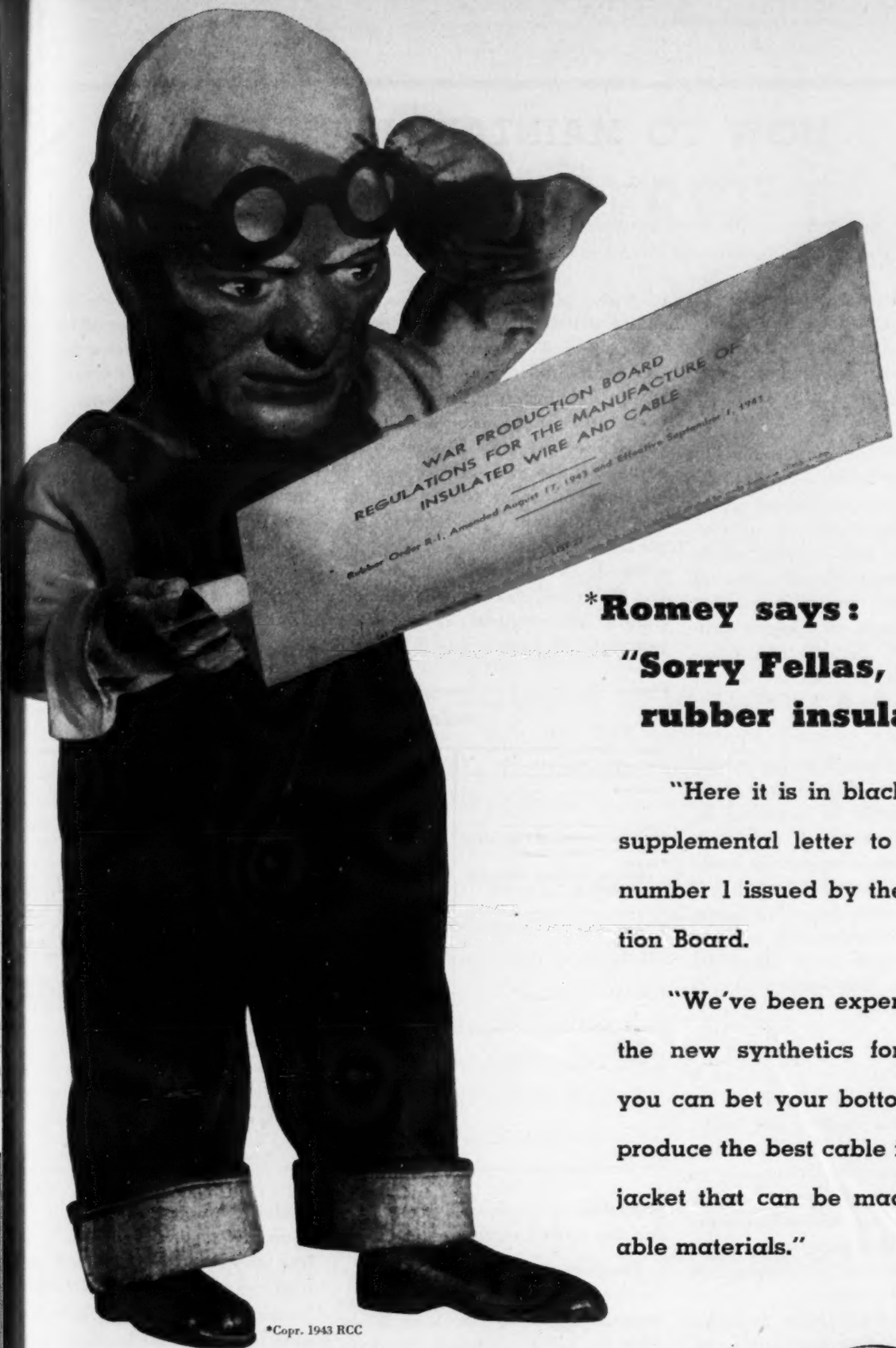


FIG. 2

FIG. 1—Electric eel barrier consists of bare electrodes (one of strands of 7-strand No. 4/0 copper) suspended from No. 6 solid WP wire spring mounted to and insulated from canal walls at Victory Mills hydro plant. FIG. 2—Eel barrier energized from station service; current limited by heater elements. (a) Narrow stream and 110 volts. (b) Larger stream and 110/220 volts



*Romey says:

"Sorry Fellas, no more rubber insulation"...

"Here it is in black and white—supplemental letter to rubber order number 1 issued by the War Production Board.

"We've been experimenting with the new synthetics for months and you can bet your bottom dollar we'll produce the best cable insulation and jacket that can be made from available materials."

*Copr. 1943 RCC

FROM BAR TO FINISHED WIRE

ROME CABLE
CORPORATION
ROME • NEW YORK

HOW TO MAINTAIN BUSHINGS

By L. WETHERILL and C. W. DAVIS, General Electric Company, Pittsfield, Mass.

A preventive-maintenance program outlined for bushings on large apparatus, such as power transformers, oil circuit breakers and high-voltage instrument transformers

CAUTION — Before attempting to clean or test a bushing, make sure that it is de-energized and temporarily grounded to remove any electrostatic charges.

Inspection — Accompanying inspection chart lists the items to be checked. Frequency of inspection depends on the importance of service continuity and on local conditions. Bushings should have a monthly visual inspection and receive a thorough cleaning at suitable intervals. Periodic power factor tests are recommended for bushings of the B, L, OF and S types.

Cleaning—Dirt deposits, which under moist conditions may cause flashover, should be removed by cleaning with water or a solvent, such as ammonia or carbon tetrachloride, applied with a cloth. If that method is inadequate a porcelain-cleaning powder, such as Lockbrite (obtainable from Locke Insulator Corp., Baltimore, Md.) is usually effective.

Power Factor—Condition of insulating materials in a bushing is usually determined by measurement of power factor (loss angle, or watts loss) with 60-cycle voltage applied. A progressive increase in power factor is evidence of changing characteristics of the insulating materials. Bushings with excessively high power factor should be removed from service.

Limiting power factor at which different operating companies consider it desirable to remove bushings from service varies from 6 to 12 percent for types A and B bushings and from 5 to 6 percent for types L, OF and S bushings. These limits are based on bushing temperatures of 10 to 25 deg. C. Test values will be higher at temperatures above 25 deg. C.

Tests should be made preferably with the bushing disconnected from other apparatus and from the connecting bus. For most accurate results the bushing should be removed from the apparatus and mounted on a conducting support. The bushing should be cleaned, and, to eliminate the effect of surface leakage, a conductor should be wrapped around the porcelain to form a guard circuit, according to the instructions covering the testing equipment used.

Insulation Resistance — Insulation-resistance tests with a megohmmeter measure bushing losses with d.c. voltage applied. In making such tests bushing should be disconnected. Use of a 2,500-volt instrument having a 20,000-megohm range is preferable. Any bushing that tests less than 20,000 megohms is in a questionable condition and should be reconditioned. In the absence of facilities for making power-factor measurements, resistance readings sometimes provide useful data.

Modernization—Bushings which must be removed from service because of their age or condition can in many cases be repaired or reconditioned. Instructions and recommendations for rebuilding will be supplied by the manufacturer if given information regarding condition of old bushing, also serial or model number and other data from the bushing name-plate. Unless adequate facilities and workmen experienced in rebuilding bushings are available, it is desirable to return the bushings to the factory or the manufacturer's nearest service shop. When a bushing is reassembled new gaskets should be installed in accordance with recommendations of the bushing manufacturer.

Maintenance Inspection Chart

Item to Be Inspected	What to Inspect For
Porcelain	Fractures, rough edges and chips from porcelain. Deposit of dirt, which under moist conditions, may cause flashover. Fractures which may cause leakage of filler.
Metal Parts (Clamping rings, etc.)	Fractures which may cause leakage of filler. Need for repainting.
Cement (Between clamping rings and porcelain)	Crumbling of chipped surfaces. Presence of oil. (Cement often absorbs oils at the factory or during installation or while in service. Here appearance of an oil film on adjacent metal or porcelain parts for as long as a year does not necessarily indicate leakage.) Need for repainting
Filler	In the type OF bushing the level and color of the oil in the gage glass should be inspected. Light color generally indicates good condition of the oil. Characteristics of oil need not be investigated as long as the bushing power factor remains in normal range. In types A, B, L or S bushings routine testing or inspection of filling liquid or compound is unnecessary unless there is evidence of leakage or unless power-factor measurements indicate that the condition of the dielectric is unsatisfactory.
Gaskets	Leakage of filling medium. Deterioration of gasket.
Line Connections	To make sure they are tight and that line connections do not put strain on bushings.
Ground Sleeve	Check level of liquid in apparatus by means of liquid-level gage to make sure that the lower end of the bushing ground sleeve is improved in liquid under all conditions.
Power Factor	To make sure that the bushing power factor remains in normal range

BANKING SERVICE FOR THE JOB AHEAD

SINCE no man can foresee how long the war will last, it is apparent that industrial management is faced with a two-fold problem. First is the paramount necessity for maximum war production to meet the needs of the armed forces. As Under-Secretary of War Patterson recently said, *"The most difficult job of all lies ahead—the drive to victory."*

Second only to meeting these vital war-production goals is the job that lies ahead in projecting plans for reconversion or production for civilian use. This job also must be faced now, if maximum post-war employment is to be assured for those at home and for the fighting men when they return.

In meeting maximum production goals, in adjusting production to changing war demands, and in planning for peace-time operations, there are many problems that require banking service. Officers of this Bank are prepared, through extensive experience in handling war-production loans and through practical study of post-war problems, to work with business executives in planning both present and future requirements. We cordially invite your inquiry.

BANKERS TRUST COMPANY

NEW YORK

Sucker Transformer Reduces Induction

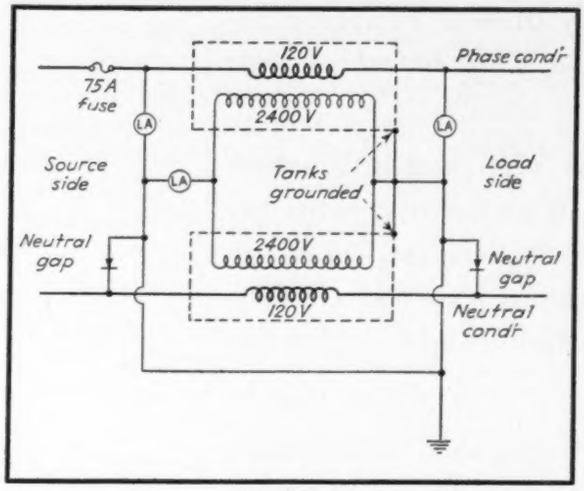
By THEODORE SEELY
Assistant Distribution Engineer Public Service Electric & Gas Company, Newark, N. J.

An inductive co-ordination problem arising from conversion of unigrounded distribution system to multigrounded common-neutral operation in a rural area of the territory served by Public Service Electric & Gas Company (N. J.) has been solved by an interesting application of the "sucker" transformer, such as has been used in the past on railroad electrification projects for reduction of fundamental frequency induction.

A long, single-phase branch of a 4-kv., four-wire distribution circuit had been equipped prior to the war period with a pole-top induction voltage regulator for maintenance of proper voltage conditions. Subsequent load growth in the area and shortage of critical materials necessitated the addition of 60 kva. in shunt capacitors just beyond the regulator and, later, the addition of another 60 kva. in capacitors at the branch extremities. Telephone lines in the area, consisting of aerial cable, are carried on the same pole line with the single-phase power circuit.

Upon conversion of the power circuit to multigrounded common-neutral operation telephone noise was found to be excessive. Bonding of telephone aerial cable to power neutral eliminated some interference; substitution of less susceptive equipment, together with the bonding, resulted in tolerable noise levels for the two-party subscribers. Tube sets which are used at the four-party and eight-party stations, however, continued to present a noise problem. These sets, which of necessity employ low-impedance ringers, normally would have experienced no noise from the common-neutral exposure because of the isolation of the telephone circuit from ground afforded by the tube. In this instance it was found that 60-cycle induction from the multigrounded power line resulted in as much as 48 volts on the telephone lines, at which voltage the tubes operated to ground the telephone circuit, permitting noise to be introduced into the receivers.

Various alternatives, all costly and requiring large amounts of critical materials, were considered for correction of this condition. Many of the telephone sets involved are of the combined type, which affords no space for substitution of relays for tubes. Reversion to unigrounded operation of the power system would have sacrificed the improved lightning performance desired for the area and required reconstruction of common-neutral extensions which had been made since the conversion. Tests showed that of the normal peak phase current of 65 amp., approximately 70 percent returned as neutral current in the earth. It was therefore decided to make a sucker transformer installation to force the neutral current into the neutral conductor and so reduce the inductive effect on the telephone lines.



CONNECTIONS for sucker transformer installation

Since no suitable one-to-one transformer was available, two 7.5-kva., 2,400-120/240-volt distribution transformers were employed for the purpose, connected back-to-back as shown in the accompanying illustration.

Grounds were removed from the power neutral for a distance of approximately 1.5 miles adjacent to the sucker location, involving only three transformer installations, to extend the influence of the sucker, this distance being approximately half of the telephone exposure. The following tabulation shows conditions before and after the sucker transformer installation was made:

Condition	Time P.M.	Power Circuit Load Phase wire (Amp.)	Neutral wire (Amp.)	Induction on Telephone (RMS Volts)
Sucker out	2.00	36	11	28
Sucker in	2.30	40	37	8
Sucker out	6:15	65	20	48
Sucker in	6.20	65	50	18

The reduction in induced voltage effected by the sucker installation has proved sufficient to restore the normal operation of the tube sets. Some six months' operation has indicated no difficulties with the installation. In normal times, without material shortages, conversion of the single-phase line to three phase would be fully justified under present load conditions. Although not recommended as a general substitute for the proper solution of the difficulties encountered, the sucker transformer in this particular instance has proved an effective and economic remedial measure requiring a minimum of critical material and having a high salvage value after the war emergency has passed.

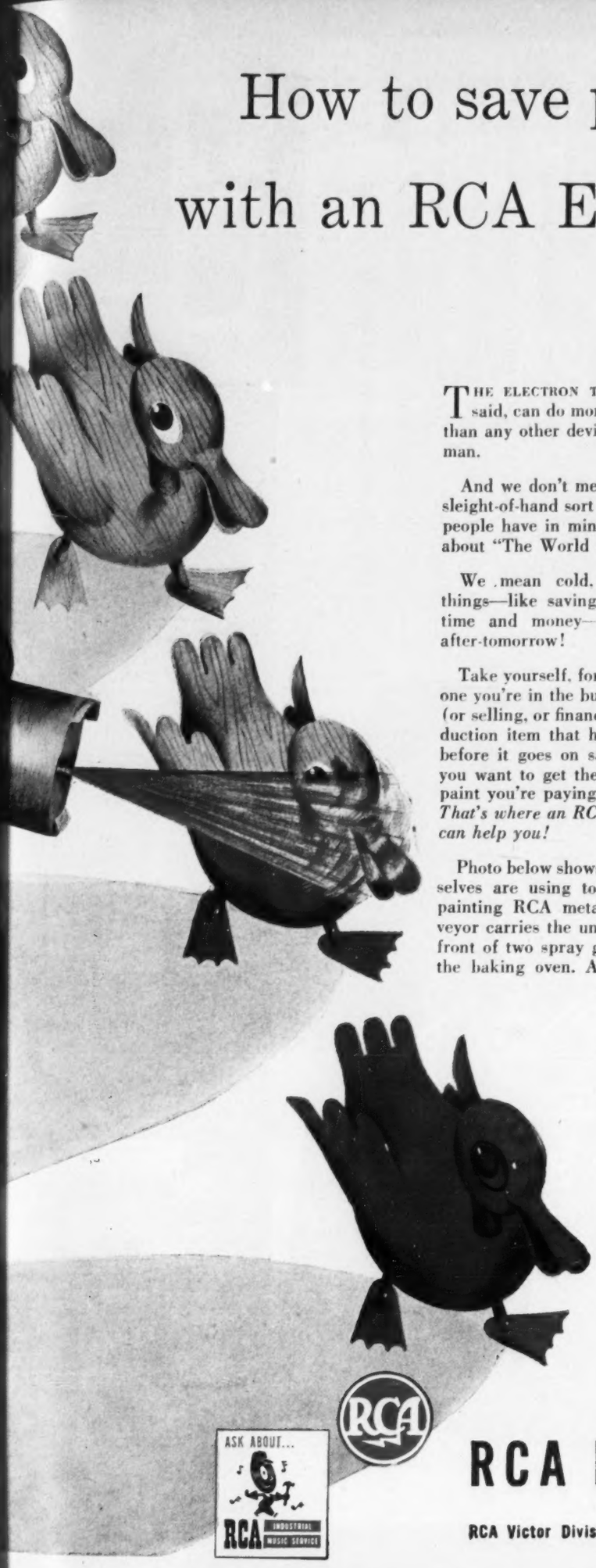
•

Plastic-Cased Coils Repaired and Patched

Modern watt-hour meters contain potential coils in plastic cases molded around them. They are not so easy to repair as the older tape- or cloth-covered coils. But if the coil tests open the chances are ten to one that the trouble is simply a break at the lead connections, a simple soldering job if it can be got at. And that's not so hard. A little judicious cutting with a small hacksaw will allow a piece of the plastic to be removed. Then the leads are followed down and the connection remade if that is where the trouble lies. But if the trouble is deeper within the coil, then the best thing to do is drop it in the junk box and try another.

The problem is not in cutting out the piece of the plastic housing, but in filling up the hole left by its removal. This is done in the meter repair shop of the Virginia Electric & Power Company with the compound that is used for sealing distribution transformer bushings. This compound can be worked with a hot soldering iron and quite a decent looking patch can be made with it in the plastic housing of the potential coil.

How to save paint- with an RCA Electron Tube



THE ELECTRON TUBE, it has been said, can do more amazing things than any other device yet created by man.

And we don't mean the wild-eyed, sleight-of-hand sort of thing so many people have in mind when they talk about "The World of Tomorrow."

We mean cold, hard, practical things—like saving a manufacturer time and money—*today*, not day-after-tomorrow!

Take yourself, for instance. Ten to one you're in the business of making (or selling, or financing) a mass-production item that has to be painted before it goes on sale. So naturally you want to get the most out of the paint you're paying for each month. *That's where an RCA Electron Tube can help you!*

Photo below shows a device we ourselves are using to save money in painting RCA metal tubes. A conveyor carries the unpainted tubes in front of two spray guns and on into the baking oven. A control mechanism, built around an electronic switch, makes certain that the guns spray each tube completely but withhold the spray if, as occasionally happens, two or more successive tubes are missing from their sockets.

An RCA Electron Tube is used to control this operation in the manufacture of tubes. And it may be that RCA can supply your engineers with information about tubes that will enable *them* to design equipment to perform some required job faster, better, cheaper, or more safely than you are now doing it.

For, just as the Magic Brain of all electronic equipment is a tube, so the fountain-head of modern electron tube development is RCA.

A copy of our booklet *Electrons in Action at RCA* is yours for the asking. Simply write Room 445, address below.

TUNE IN "WHAT'S NEW?"

RCA's great new show, Saturday nights, 7 to 8, E. W. T., Blue Network.

The Magic Brain that operates this device is an RCA Electron Tube—Type Number 2050. By seeing to it that a minimum amount of paint was wasted against non-existent tubes, it justified the entire cost of installation in a very short period of time.

ASK ABOUT... RCA INDUSTRIAL MUSIC SERVICE

RCA ELECTRON TUBES

RCA Victor Division • RADIO CORPORATION OF AMERICA • Camden, N. J.

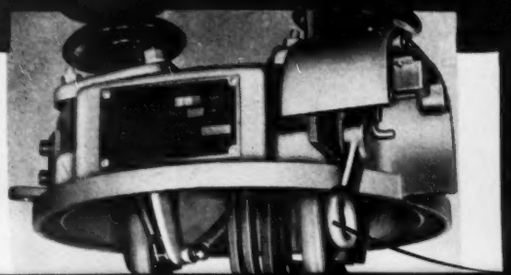
NO CLOCKWORK NO MOTORS

Trouble Free KYLE Circuit Breaker Relies on a Dependable Hydraulic Mechanism

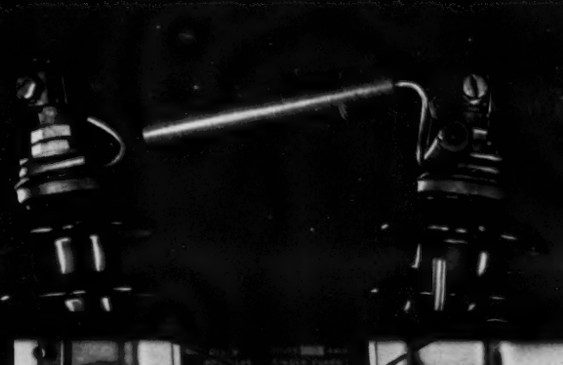
With the use of an absolute minimum of mechanical parts, the Kyle Circuit Breaker provides the ultimate in circuit breaker operation.

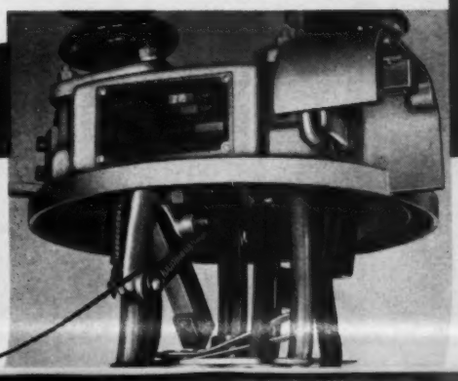
A majority of the faults occurring on any system are of a temporary nature. Generally the first opening of the breaker will clear such faults. The time delay mechanism of the Kyle Circuit Breaker gives a fast opening on each shot and a delayed closing between shots. By the time the breaker has thus operated three times, the chances of temporary fault are negligible.

In this way the breaker allows maximum protection for the line and requires manual operation for closing only after the seldom occurring fault has been corrected. This can be done with the utmost safety with any hook, not necessarily an insulated one, because the handle is "dead."

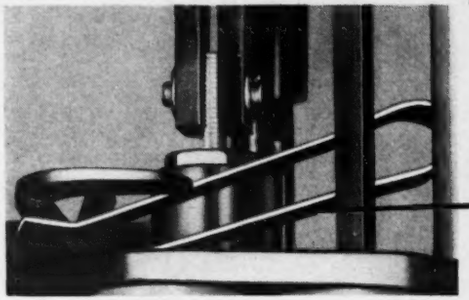


venting any possible accidental closure, insuring a protection to anyone working on the line.

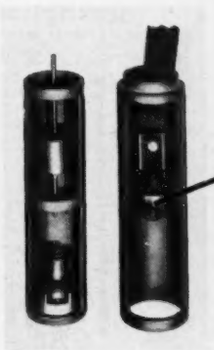




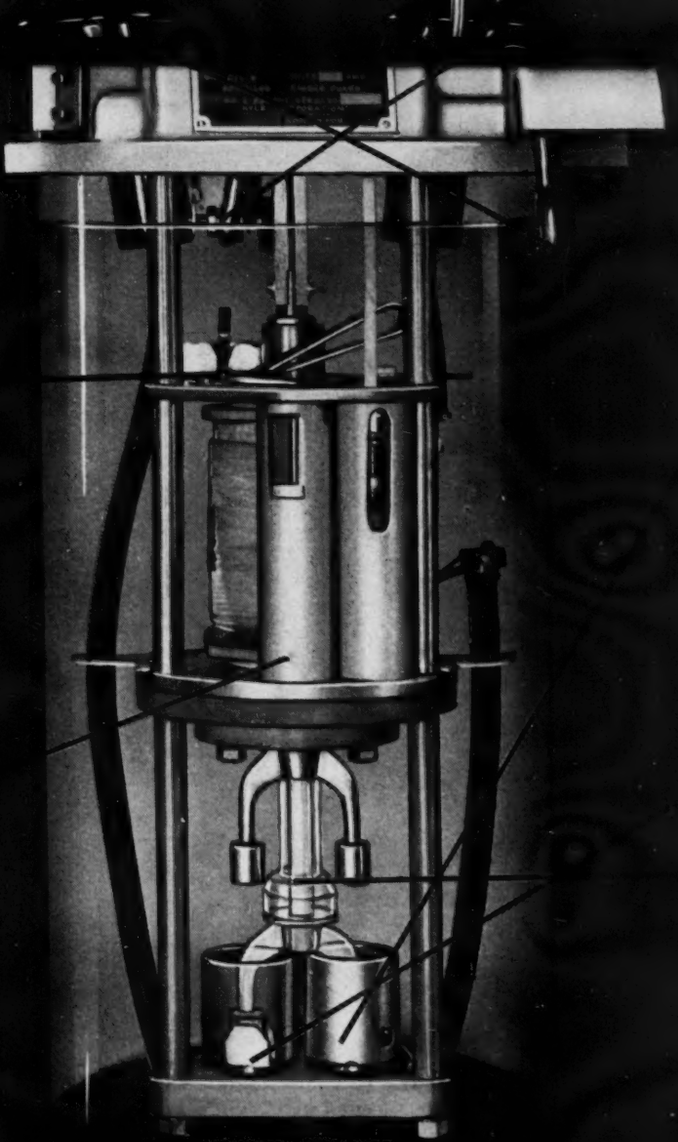
consisting of operating



A thermal trip set at 200° F. is provided to prevent damage to insulation should overheating occur. This consists of a bi-metal strip, located just under the release trigger. As temperature increases, the free end of the bi-metal strip raises until it trips the release trigger and causes the breaker to lock out. This prevents burn-up from heavy overload.



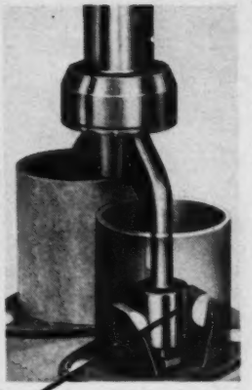
The retard piston (right) which is attached to the contact closing mechanism through the bakelite tie link, rides in the cylinder as shown. The piston moves up after contacts open. Reclosing of the contacts is hydraulically delayed by restricting oil flow past the piston while in the upper cylinder; and when the piston reaches the lower cylinder, free drop results in fast closing of the contacts eliminating burning. The release piston (left) is actuated upward by the pumping of oil under the piston in measured amounts. The plunger acts as the pump, making an injection each time the breaker opens and after four operations in succession the piston is driven high enough to trip the release latch opening the breaker to the lockout position. If it is not necessary for the breaker to lock out, the release piston settles back to its initial position.



consisting of operating handle and cover, is dead. The tank is dead and provisions are made for grounding it.

●

Contacts are unusually well protected against flashover with a fiber protecting cup. Note the split type lower stationary contacts, which fit cup-like into the upper movable contacts. The special arcing tips which ride on the outside of the upper movable contacts eliminate burning of the main current carrying surface. The load is always carried on clean contacts.



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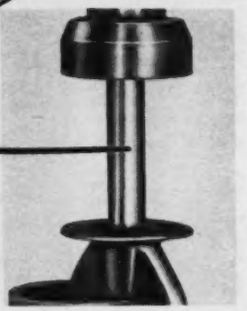
By incorporating a double break, the rupturing capacity of the breaker is increased and a reduction made in the burning of contacts. Inasmuch as the lower current-carrying contacts do not burn, the upper contacts and consequently the plunger returns always to the same position. This means that the relation of the plunger to the coil is constant, thereby resulting in continual tripping characteristics.



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When a fault occurs the coil, which is in the breaker circuit as long as the contacts are closed, is sufficiently energized to raise the steel plunger which normally rests upon the top of the contact member. The plunger on moving into the coil finally imparts a hammer blow to the contact tie rod, raising the contacts and producing a very fast break with the minimum of arcing.

KYLE KC CORPORATION

HOW TO CONSTRUCT WOOD RACKS FOR POLE-MOUNTED CAPACITORS

By EARL H. KENDALL, Commonwealth & Southern Corporation, Jackson, Mich.

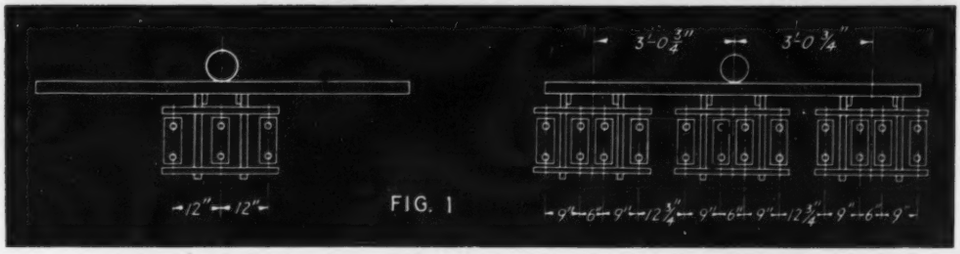


FIG. 1

Fig. 1 — General layout of racks and 15-kva. capacitors delta or wye connected to a three-phase circuit; mounting on an 8-ft. distribution crossarm. For 45-kva. installations (left) use one capacitor per phase and one rack. For 90-kva. installations use two capacitors per phase and two racks with centers 1½ ft. from pole center line. For 135-kva. installations use three capacitors per phase and three racks. For 180-kva. installations (right) use four capacitors per phase and three racks.

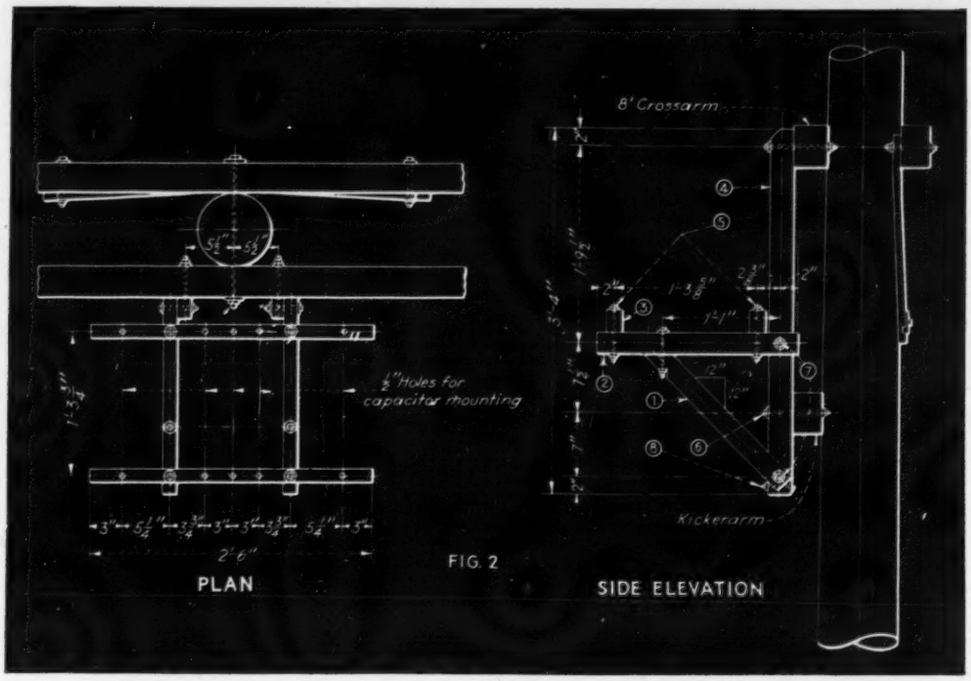


FIG. 2

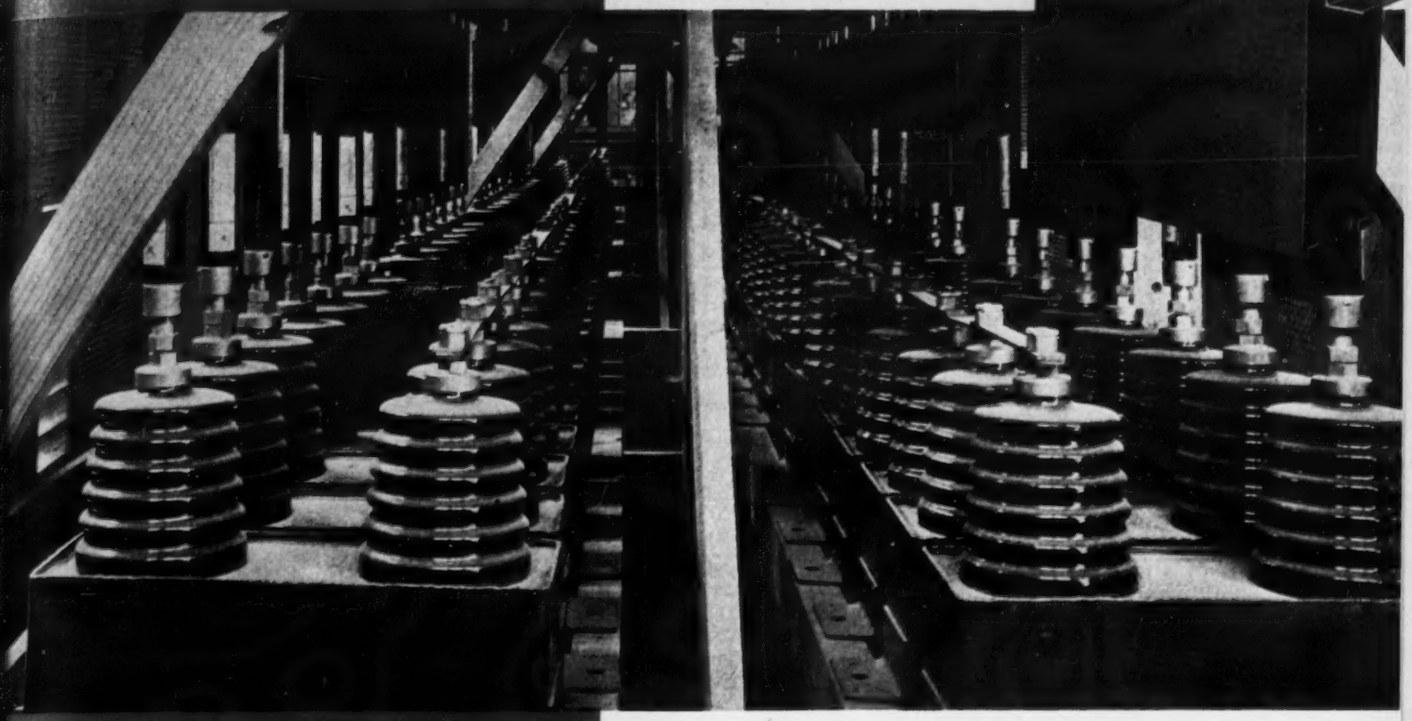
Fig. 2—Construction details of wood rack; plan view (left) and side elevation. An 8-ft. distribution crossarm is used for the top support. For bottom support for one rack use one 3½x4½x20-in. kickerarm and for two to four racks use one 8-ft. crossarm.

RACK MATERIAL LIST

Item	No. Req'd	Description	
1	2	Brace	1½ x 2½ x 21 in.
2	2	Support	1½ x 2½ x 22 in.
3	2	Crosspiece	1½ x 2½ in. x 2 ft. 6 in.
4	2	Upright	1½ x 2½ in. x 3 ft. 4 in.
5	6	Galv. bolts	½ x 6 in. with 2 round washers
6	4	Galv. bolts	½ x 7 in. with 2 round washers
7	4	Galv. bolts	½ x 4 in. with 2 round washers
8	2	Galv. bolts	⅜ x 3 in. with 2 round washers

Layout and construction details of wood capacitor racks adopted by companies of the Northern Division of the Commonwealth & Southern system. These data supplement the information in an article "Capacitor Racks of Wood Replace Steel" in ELECTRICAL WORLD, October 16, 1943, issue, page 86. Electrical connections will be outlined in a subsequent issue.

ATISFYING KILOVAR REQUIREMENTS F LARGE LOCALIZED WAR LOADS...



ith C-D Capacitors!

any systems have solved the problem of pplying the reactive requirements of rge localized war loads by using standard D capacitors in banks. Not only has this ethod increased the voltage level at crit- l load points, but it has also increased working load capacity of the entire sys- n. C-D capacitor installations in banks up 50,000 kva are now serving the war-time quirements of many localities. The ad- ntages of this method can very well apply the requirements of your system. Why t consult with our engineers today? rnell Dubilier Electric Corporation, uth Plainfield, New Jersey.

10 REASONS WHY C-D CAPACITORS OFFER THE BEST SOLUTION FOR LARGE BLOCKS OF KILOVARS

1. C-D Capacitors are available on relatively short notice.
2. C-D Capacitors can be located at or near the load with minimum use of critical materials and man-hours.
3. C-D Capacitors will have a very high re-use value elsewhere on the system after the war.
4. C-D Capacitors can be installed and put into operation in a fraction of the time required for other types of corrective equipment.
5. C-D Capacitors are extremely flexible—circuit arrangement will permit the switching of corrective capacity to conform to load requirements.
6. C-D Capacitors are extremely mobile — they can be quickly removed to other locations to relieve sudden unforeseen low power-factor conditions.
7. C-D Capacitors offer the most efficient reactive source and require a minimum of maintenance and attention.
8. C-D Capacitors are durable. Impregnated and filled under vacuum with non-inflammable and non-explosive Dykanol. Hermetically sealed in non-corrosive welded containers. Equipped with sturdy, glazed, porcelain bushings.
9. C-D Capacitors are dependable. Engineered and manufactured by specialists who have made "capacitors" their exclusive business for over thirty-three years.
10. C-D Capacitors have a proven record of performance. There are more C-D Capacitors in use today than any other make.

Cornell Dubilier Capacitors

FOR POWER-FACTOR CORRECTION

CORNELL-DUBILIER CD CAPACITORS

Averts Bottleneck in Coal Handling

Although it may be only a few yards from the coal pile to the bunkers, fuel might as well be in the next county if no means are available for getting it into the station.

Realization of this fact recently led Public Service Company of Oklahoma to install stand-by equipment for transferring coal from storage piles to bunkers in the crusher house at its Tulsa station. Previously a 3-yd. clamshell bucket and traveling crane had been used exclusively for this purpose. It became evident recently that under wartime conditions a minimum of 24 hours would be required to repair a breakdown in either crane or clamshell hoist motors, even if a standby motor was available. Station coal bunkers did not have 24-hour storage capacity. Something had to be done.

Priority conditions precluded purchase of a new conveyor for raising coal the 40 ft. from car to bunker. Fortunately, however, a bucket conveyor, in usable condition, was available at another system station which had been converted to gas operation. This was transferred to Tulsa station and installed.

A track hopper was installed at the lower end of the conveyor. This permits use of an available 5-yd. carryall scraper and tractor combination to deliver stored coal to the conveyor when the crane is out of operation.

Buckets on the used conveyor were spaced 18 in. apart on a continuous chain that passes up from the track hopper and along the top of the bunkers. Coal can be discharged into selected chutes along the bunkers as desired.

Although the conveyor was initially too short for Tulsa station conditions, extra buckets were made up locally. Links for extending the chain were made from discarded traveling screen links cut down from 24 to 18 in. and re-drilled. The necessary rollers were cast blank and machined to size in the plant shop.

The stand-by conveyor has now been installed at this station for several months and a potential bottleneck in coal-handling facilities averted.

•

How to Close, Trip Circuit Breakers

7. Pneumatic Mechanisms*

By G. J. EASLEY,
Switchgear Engineer
Westinghouse Electric & Manufacturing Company

The latest development in closing methods for circuit breakers uses a pneumatic arrangement with compressed air pressures up to about 300 psi., depending on the size of breaker. Such a device for large outdoor breakers is shown in Fig. 1. The preferred application for outdoor installations includes a compressor unit for each breaker, although indoor breakers which are not too far apart often use a common compressor for several units. Of course, the failure of an individual compressor affects only one breaker, while the failure of a central unit may affect several breakers. To minimize chances for trouble it is well to avoid long air lines between outdoor breaker installations, especially where freezing weather is often encountered.

The pneumatic mechanism elimi-

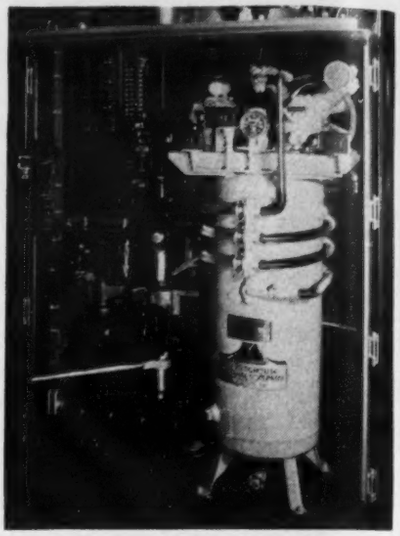


FIG. 1—Pneumatic mechanism for operating circuit breakers

nates the need for a large station battery; heavy control cables are no longer required. Closing energy for several operations may be stored in the compressor tank, yet only a ½- to 1-hp., single-phase a.c. compressor motor is needed for an individual unit. Reclosing speeds as low as 20 cycles are possible with the pneumatic device. Compressed air action is much faster than a solenoid since air pressure is available instantly, whereas the solenoid requires time to build up its force.

The pneumatic mechanism consists of a suitable size cylinder and piston (6 in. to 9 in. diameter on large breakers), a magnetically controlled inlet valve (operated by conventional *X-Y* control relay scheme), a throttle for controlling flow of air during closing stroke, and a dump valve. The pneumatic device does not inherently match the breaker load characteristics as does the solenoid mechanism; if uncontrolled, the pneumatic mechanism has maximum pull available at the beginning of the closing stroke. Obviously, this would not be desirable on most breakers; the light load during the first part of the closing

*Seventh in a series of twelve articles which began in August 7, 1943, issue of "Electrical World."

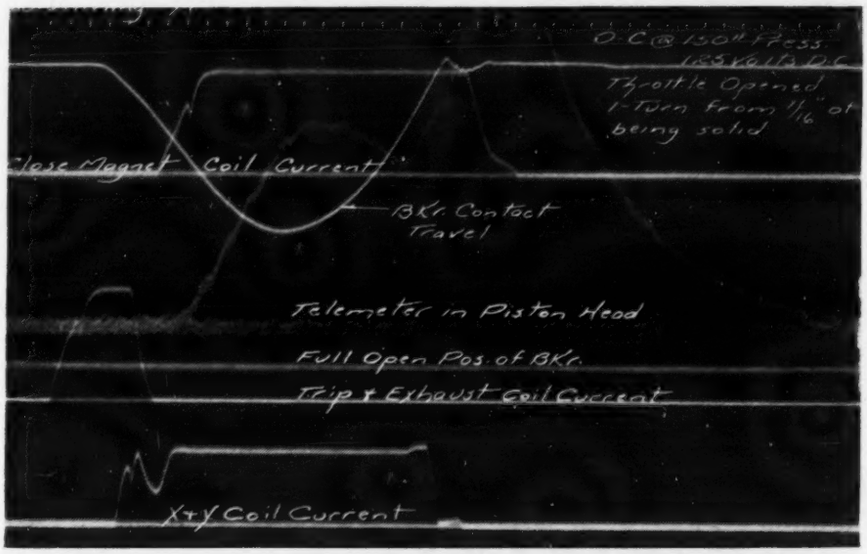
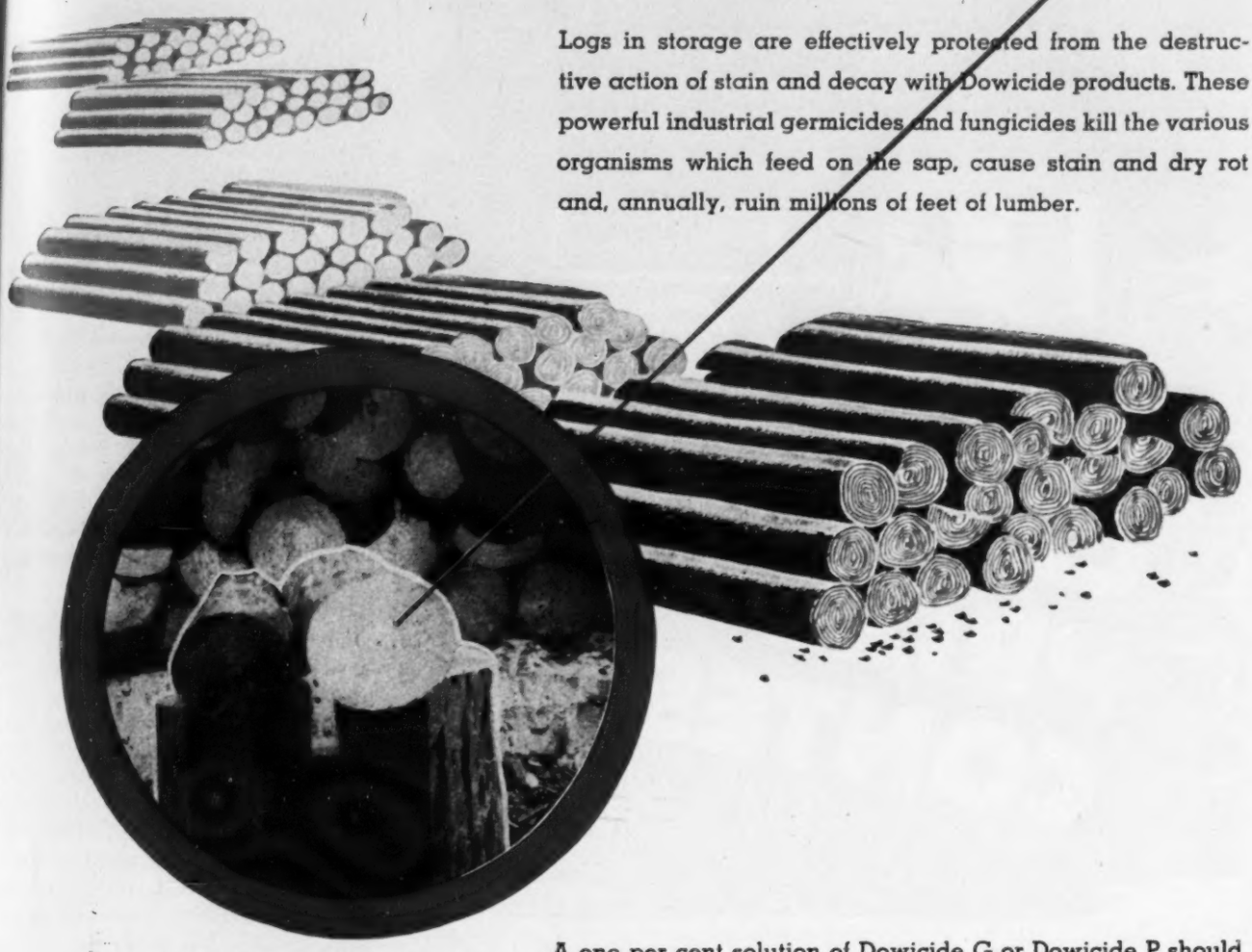

Throttle Opened 1-Turn From 1 1/16 at being solid
Close Magnet Coil Current
Bkr. Contact Travel
Telemeter in Piston Head
Full Open Pos. of Bkr.
Trip & Exhaust Coil Current
X+Y Coil Current

FIG. 2—Timing oscillogram showing sequence of closing operation for pneumatic mechanism

How to safeguard valuable logs in storage

Logs in storage are effectively protected from the destructive action of stain and decay with Dowicide products. These powerful industrial germicides and fungicides kill the various organisms which feed on the sap, cause stain and dry rot and, annually, ruin millions of feet of lumber.



Log at left untreated—log at right protected by dipping in 1% Dowicide solution.

A one per cent solution of Dowicide G or Dowicide P should be applied as soon as possible after cutting, preferably within 24 hours. Treating can be done in the woods or at the time of unloading the logs at the banking location.

For complete information on how to safeguard valuable logs in storage, write to Dow requesting Dowicide bulletin No. 42.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Cleveland • Chicago • St. Louis • Houston • San Francisco
Los Angeles • Seattle

Dowicide's Use in Power Transmission and Communications

Poles and other timbers for outdoor use produce longer service and require less maintenance when impregnated with Dowicide. Oil soluble Dowicide 7 and water soluble Dowicide G are both used for this purpose. Either is simple to use leaving the wood odorless, free of discoloration, completely paintable and efficiently protected from decay and termites.

DOWICIDE

GERMICIDES AND FUNGICIDES

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

FOR RADIO MEN IN THE SERVICE!

"WRITE A LETTER"

As you know, the Hallicrafters make a wide range of Radio Communications equipment, including the SCR-299 Mobile Communications unit. We are proud of our handiwork, proud of the job you men have been doing with them on every battlefront.

RULES FOR THE CONTEST

We want letters telling of actual experiences with this equipment. We will give $100.00 for the best such letter received during each of the five months of November, December, January, February and March! (Deadline: Midnight, the last day of each month.)

We will send $1.00 for every serious letter received so even if you should not win a big prize your time will not be in vain.

Your letter will be our property, of course, and we have the right to reproduce it in a Hallicrafters advertisement.

Good luck and write as many letters as you wish. V-Mail letters will do.

BUY MORE BONDS! W. J. Halligan

the hallicrafters co.

2611 INDIANA AVENUE • CHICAGO, U.S.A.

MAKERS OF THE FAMOUS SCR-299 COMMUNICATIONS TRUCK

stroke would allow excessive closing speeds and hence would result in hard slamming of the breaker. The automatic throttle restricts air flow during the first part of the closing stroke and is mechanically coupled to the unit to open wide near the end of the closing stroke. This arrangement results in a smooth closing stroke with maximum power at the end when the breaker load is highest.

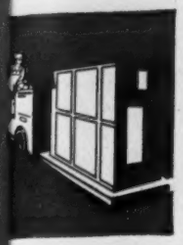
Reclosing Operation

Fig. 2 is an oscillogram showing a reclosing operation on a pneumatic installation. The fuzzy line shows air pressure as measured by a telemeter—note the large hump indicating movement of the throttle to wide-open position. One alternative to the automatic throttle makes use of a fixed throttle opening throughout the closing stroke; here a breaker with load characteristics more nearly matching the mechanism is employed.

Pneumatic mechanisms may use a simple single-lever, single-latch arrangement; this is especially desirable for high-speed reclosing where the breaker opens only part way, since it does not need to be mechanically trip free. The dump valve is either mechanically or electrically coupled to the trip coil. Thus, any close-open operation, which normally operates the trip coil, will also operate the dump valve and quickly remove high-pressure air from the driving side of the piston. Thus there will be no drag on breaker opening, so that the mechanism is pneumatically trip-free instead of mechanically trip-free. On smaller breakers, where manual closing is possible with a single quick sweep of the hand lever, the unit may be made mechanically trip free on hand closing only; at the same time, the single-lever arrangement for electrical operation can be retained.

When used in connection with air-blast breakers, this mechanism is also arranged for pneumatic tripping through application of air to the opposite side of the piston. In case of air failure the breaker must not trip, since air is necessary for arc interruption. However, where arc interruption is independent, as on oil breakers, it is desirable to use the conventional spring opening which will function independently from the air supply.

This CONSERVATION PLAN *will help you* SAVE MAN-HOURS... SAVE MATERIALS... SPEED PRODUCTION

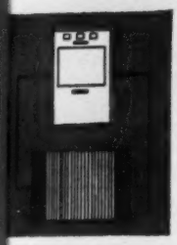


1. Conserve

by strategic selection, application and use of electrical equipment.

EXAMPLE

"Factory-packaged" equipment saves installation time and materials. An illustration of this is the Westinghouse "Power Center" which combines all transformer and switching equipment into one ready-to-use unit.



2. Conserve

by utilizing new developments that reduce need for critical materials and man-hours.

EXAMPLE

High-frequency heating reduces, by as much as 95%, the curing time required for producing thick plywood, plastics and other nonmetallic substances.

3. Conserve

by utilizing available facilities for preventing breakdowns and reducing machine outages.

EXAMPLE

"Maintenance Hints"—a complete, pocket-size manual covering recommended upkeep practice for electrical apparatus—is a maintenance help available without charge. Check your Westinghouse representative for copies.

4. Conserve

by utilizing materials which in many cases can replace critical materials and do a better job.

EXAMPLE

Phos-Copper brazing alloy is easing bottlenecks created by a shortage of tin solders for joining metals. In some cases, one pound of Phos-Copper eliminates the need for as much as 12 pounds of tin.

5. Conserve

by tapping all sources of salvageable scrap.

EXAMPLE

Systematic planning can uncover many ways of reclaiming worn equipment and waste material. Samples of salvage forms and organization charts in use in Westinghouse plants will gladly be made available on request.

Wartime Conservation means MORE than just conserving copper, steel, aluminum . . . it means the most strategic possible use of all of the ingredients of Victory—materials, manpower, time and ingenuity.

These five major points comprise a complete program developed by Westinghouse for Wartime Conservation. This program packages up Westinghouse engineering experience in the entire field of electric and power equipment and related materials. Examples noted are but five of many specific recommendations.

This experience and these recommendations are offered fully and without obligation.

Ask your Westinghouse representative today for a copy of the new 100-page book, "WARTIME CONSERVATION." Or write direct to Dept. 7-N, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

J-20452

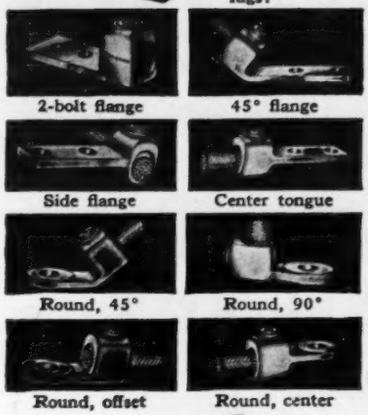
Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SAVE TIME—select your conductor fittings from this Catalog . . **ALL** good types

You can buy Tee Connectors, Grounding Clamps, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Service Connectors, Bus Supports, Terminals . . . *practically every good type, in the COMPLETE line.*

JUST FOR EXAMPLE— here are some of the standard Penn-Union Vi-tite terminal lugs:



These types and many more—in a *complete* range of sizes. Write for Catalog.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors. They have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

Control for Station Auxiliary Power

By L. H. HENLEY
Vice-President
Southeastern Indiana Power Company

Power for station auxiliaries at the Southeastern Indiana Power Company's plant, Rushville, Ind., can be supplied by either or both of two transformers which are connected to the two-section generator bus. Each transformer is rated 300 kva., three-phase, 4,160-480 volts and only one is needed to supply the requirements of the station; the second is normally a standby unit. For schematic diagram of power system for station auxiliaries see ELECTRICAL WORLD, October 16, 1943, issue, page 109.

Wiring and control is so arranged that both transformers may be operated in parallel or power switched automatically from one bank to the other instantaneously.

Switching Arrangement

Three of nine units of the 4,160-volt metal-clad switchgear are breakers for the bus-tie and for the auxiliary power supply. The former is a De-ion 1,200-amp., 5,000-volt, 100,000-kva. interrupting capacity air breaker; the latter are two De-ion 600-amp., 5,000-volt, 100,000-kva. interrupting capacity air breakers, one for each transformer.

The bus-tie breaker is placed in the center unit of the switchgear so that one station auxiliary power transformer and one substation step-up transformer (4,160/34,500 volt) are fed from that section, while two station generators feed into it. When the bus-tie breaker is closed the primaries of the auxiliary power transformers are paralleled.

The 480-volt circuits from the station auxiliaries' two transformers feed a single-unit metal-clad switchboard. On this panel there is mounted two type DK-25 De-ion air breakers, electrically operated for the control of each three-phase, 480-volt incoming circuit, and equipped with low voltage automatic transfer control. When both breakers are closed the transformer secondaries are paralleled on a station power bus. A type DK-25 De-ion air breaker is also provided with manual control and equipped with short-circuit trip devices only. The latter breaker connects the station power bus directly with the Trumbull Flex-A-Power distribution system, which runs the entire length of the building, and from it are taken the various motor and plant auxiliary feeds.

The control panel is also equipped with two type CV low-voltage relays and two MC auxiliary relays to initiate the automatic transfer from one transformer bank to the other in case of low voltage on the supplying station feeder. A transfer switch changes automatic operation to manual control in case parallel or manual operation is desired.

•

Dry and Flush Algae From Condenser Tubes

At Canal and Waterside stations of the Louisville Gas & Electric Company it has been found that unit type air heaters are an effective tool for drying and flushing soft algæ deposits and slime from condenser tubes. The unit heaters are installed in the manhole openings of the condenser water box and warm dry air directed through the tubes. As residual water is evaporated the algæ deposits dry up, curl and can be flushed from tubes readily with water. About 48 hours are required to clean a condenser when an air heater is used, in this manner. Very little labor is required.

In horizontal condensers the operation can be speeded somewhat by blowing the excess water from the condenser tubes before the drying operation is started. This reduces the amount of residual water that has to be evaporated by the air from the unit heaters. This quicker method requires only about 36 hours to clean the algæ and slime from the tubes.

Vertical condensers with unit heaters installed at the bottom blowing air up through the tubes dry out much faster than horizontal type condensers because the excess water drains from the tubes quickly by gravity, eliminating the need for blowing it out with air.

Blowing warm air through the tubes is to be preferred to the practice, used in some quarters, of drying out the condenser to remove algæ by cracking the throttle valve and allowing steam to pass into the condenser.

BUT DEATH TO UNSTABLE TURBINE OILS!

Merely because your turbines are running "smooth as silk" today is no reason for assuming that they can't give you trouble in the near future. For when those devilish, little air bubbles get working on an unstable oil, trouble starts.

To make certain the oil you now use is doing the job it should, compare its performance with the performance records of Shell Turbo Oil which we will be glad to furnish you on request. You'll find the *oxidation stability* of Shell Turbo Oil far beyond what was ever thought to be possible in turbine operation a few years ago. And when you couple this with the ability of Shell Turbo Oil *to prevent rust,* you have a turbine oil that's worthwhile investigating.

You can't afford to wait until trouble starts . . . call in the Shell man now. Or write Shell Oil Company, Inc., Dept. "H," 50 W. 50th Street, New York 20, N. Y. or 100 Bush Street, San Francisco 6, Cal.

SHELL

SHELL TURBO OIL

Currently, the U. S. Navy has first call on Shell's entire production of marine turbine oil

M-R *Extruded*
PLASTIC TUBINGS

MITCHELL-RAND *for* **54 YEARS THE ELECTRICAL INSULATION HEADQUARTERS**

MIRAFLEX
MIRATEN
MIRALON
MIRAGLAS
MIRADIE

	MIRAFLEX	MIRATEN	MIRALON	MIRAGLAS MIRADIE
Dielectric Strength 020 Wall Dry Wet	750 VPM 350	1000 VPM 1000	1000 VPM 1000	850 VPM 815
Water Absorption after 34 hours	1.5%	0.5%	0.6%	0.4%
Tensile Strength lbs. per sq. in.	2,150	4,000	4,000	3,000
Life at 105° C.	400 hrs.	1,000 hrs.	1,000 hrs. (plus)	
Resistance to Brittleness	Does not become brittle or shatter at —40° F. —58° F. —50° C.			
Wemco Oil Test 48 hours.—100° C.	All grades passed satisfactorily			

non-combustible
extremely high dielectric
great tensile strength
solders successfully
ages very well
flexible and elastic
resists solvents
resists high and low temperatures
resists abrasion
won't brittle
thin or thick walls
moisture proof
made in transparent and six colors

FREE FOR YOUR ASKING. A Sample Card of Varnished Tubings; samples to fit sizes from B&S wire 220 (.032") to 20 (.325"). . a Wall Chart with quick easy to read reference tables of electrical symbols, capacity of conductors, dielectric averages of insulating materials, mathematical tables, tap drill sizes, standards of varnished tubing sizes . . . Wax and Compound Guide Book and the M-R Book of Electrical Insulations.
ALL ARE FREE FOR YOUR ASKING . . . WRITE FOR THEM ON YOUR LETTERHEAD

INSULATION M-R COMPANY EST. 1889

MITCHELL-RAND INSULATION COMPANY, INC.
51 MURRAY STREET COrtlandt 7-9264 **NEW YORK 7, N. Y.**

Fiberglas Varnished Tape and Cloth
Insulating Papers and Twines
Cable Filling and Pothead Compounds
Friction Tape and Splice
Transformer Compounds

A PARTIAL LIST OF M-R PRODUCTS
Fiberglas Braided Sleeving
Cotton Tapes, Webbings and Sleevings
Impregnated Varnish Tubing
Insulating Varnishes of all types

Fiberglas Saturated Sleeving and Varnished Tubing
Asbestos Sleeving and Tape
Extruded Plastic Tubing
Varnished Cambric Cloth and Tape
Mica Plate, Tape, Paper, Cloth and Tubing

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Nutrition Program Makes Friends

By L. F. RIEGEL
Gulf States Utilities Company, Beaumont, Texas

Large opportunity for betterment of public relations is open to electric utilities in the promotion of an effective nutrition program. Proof of this statement is plainly to be seen in the experience of the Gulf States Utilities Company, which last winter started to organize "Health for Victory Clubs." Because of local conditions it was impractical to organize the clubs in single industrial plants according to the original Westinghouse pattern; instead, the clubs were set up on a community basis under joint sponsorships of local industries and organizations assisting the war effort.

Community Organizations

The company serves about 90,000 residential customers in an area of about 27,500 square miles containing 254 communities, many of them very small, the largest being Beaumont and Baton Rouge, each with a population of around 100,000. Up to June 1, the result of about six months' work, 30 clubs had been formed. These clubs have held a total of 140 meetings with a combined attendance of nearly 11,000. This combined figure includes much repeat attendance, of course, but it can be said that the figure does represent that many favorable impacts made on the public consciousness by the company. In addition to this are the plus values of advertising and other publicity means used by the company in promotion of the clubs, together with many hundreds of column inches of local newspaper items reporting the activity in the various communities.

This community co-operation was secured through the efforts of home service advisers and customer service representatives who personally contacted personnel directors of war industries, county demonstration agents and other governmental employees in health work, and civilian war agency representatives, then arranged meetings at which joint sponsorship was effected. As a result of joint sponsorship, meeting places such as schools, churches and public housing project assembly halls, which as a rule are not available for private use, were placed at the company's disposal and this enabled us to organize clubs in neighborhoods that otherwise could not have benefited by the program.

The company has avoided any imputation of commercial exploitation of electric cooking in its promotion of the Health for Victory program by employing whatever cooking fuel is most commonly used in the particular community, even bottled gas. Thus it is apparent that the company is grinding no commercial ax, but is simply trying in friendly manner to help the war effort.

The Electric Utilities' "E"

To industrial plants the Army-Navy "E" is awarded for excellence in war production. The power companies, not being direct producers of guns or ships or planes, do not qualify for that recognition. But they have their own "E," as is pointed out by this advertisement of the Florida Power & Light Company.

Post-war Plan for Lighting Promotion

Just how dealers, contractors, utilities, all concerned with the promotion of good lighting, can be ready to get going right when the war ends is shown in these eight points set forth by O. R. Doerr, general sales manager, Pacific Gas & Electric Company.

1. *Make a Field Survey of Lighting Conditions*—Survey customers' premises to determine which establishments are properly equipped to continue "as is" after the war, which must be wholly revised, or partially revised and, of the latter, what changes are necessary to serve peacetime operations properly. Make rough estimates of the cost of relighting and rewiring. Post this information on cards or sheets and file for ready reference. Use competent men for this work, otherwise your effort will be wasted. A summary of this survey will indicate the potential market in your community. Of course this must be an "as, when and if" job, dependent upon available manpower and many other factors.

2. *Prepare a Training Program for Salesmen*—Really good lighting salesmen are going to be scarce after the war. Salesmen will be available in two classes: (1) A few experienced lighting engineers, and (2) young college men and novices who must be completely trained. For the first class, refresher courses will suffice. For the inexperienced men, be prepared to train them in fundamentals, in lighting application, in general layout and wiring and switching arrangement, and in figuring the economics of owner cost and operation. Make this a specific training operation for sufficient length of time to train the personnel adequately.

It is certain that a more widely

trained and a higher type of lighting engineer will be required post-war to select properly and apply the wide variety of point and linear type light sources which will be available. Furthermore, with the new exposed and larger light sources already available, the factors of relative surface brightness, the relationship of the surroundings and the necessity of more efficient light control will require better engineering in application.

To help solve manpower problems, it is suggested that the industry keep in touch with experienced men now on leave to the services.

3. *Prepare a Sales Program for Action*—In a general way prepare a sales plan just as though you were going to put it into practice in your own organization tomorrow. It must be geared to use new types of equipment, properly engineered to supply higher levels of illumination. It must definitely outline your scheme of co-operation with other agencies, your approach to the ultimate purchaser, and your objective. Remember that the competition for your share of the customer's dollar is going to be keener than you have known it to be. Also remember that obsolescence and the real need of modernization have been accumulating all through the war period.

4. *Hold Meetings with All Classes of the Electrical Industry Involved*—The manufacturer, the wholesaler, the retailer, the contractor and the utility must all sit down together to summarize the situation and co-ordinate ideas. Each branch of the industry must be fully cognizant of plans and objectives of all other branches. All branches and agencies must agree on good sound plans and approaches. This will eliminate controversy as to what lighting level is best, the number and types of fixtures to be sold, and the cost and satisfaction which will result. For the sake of more certain selling, let us all tell the same story.

5. *Co-operate With All Civic Organizations to Celebrate Victory With a Big "Light-up" Event*—Be prepared to take full advantage of any local or nationally laid plans to celebrate the conclusion of the war under the title "Light Up Day" or "When the Lights Go On Again All Over the World," "Light Up With Victory," etc. Well-organized committees are already set up locally and nationally to "turn on the light" and, so far as possible, to restore pre-war conditions. There are many ways to make the plan very effective.

6. *Plan Advertising and Publicity Campaigns*—Plan publicity and advertising now. Determine the media to be used, what type of customer education is most needed and the term during which customer determination and action must take place. Do not make it too long and be sure to discuss the objectives of the publicity and advertising plan with the sales organization before the copy is written.

7. *Plan for Sufficient Stocks of Fixtures, Lamps and Related Items*—Anticipate in so far as possible the kinds, types and cost of lighting fixtures and lamps which are to be available post-war. Make arrangements so that stocks of fixtures and lamps to meet post-war needs will be on hand without too much delay. Do not wait for brand new styles and types of fixtures. Present stocks which are likely to become obsolete should be moved before obsolescence is actually a factor.

8. *Build a Financial Reserve for Post-war Operation*—Large and small electrical concerns should begin now to set up financial reserve to finance promptly and adequately the class of business they expect to handle post-war. The market may be larger than most of us realize.

•

Ads Get the Irons

If you want to hit the jackpot, you've got to keep on trying. That truth about advertising was learned on the second try by J. D. Thomas, a Waynesburg, Pa., electrical dealer, as reported in "Contact," customer publication of the West Penn Power Company. Mr. Thomas ran a one-column, five-inch classified ad in the local newspaper, hoping thus to bring in some old flatirons for repair and resale. Nothing happened, so Thomas decided to "skip it." Two weeks later, however, something impelled him to run the ad again. This time irons started coming in—so many, that Thomas repeated the ad.

Soon he had 50 old irons—all but two of which he has repaired and resold. These two are mail order makes, for which Thomas has not been able to secure parts.

Now he is using this same type of advertising to bring in all small appliances and finds that his business has so increased that his service department must be moved upstairs to the main display floor.

Customer Service Report, Georgia Power Company, September, 1943

This tabulation shows results obtained in eight months of operation of Georgia Power's plan of customer service. The company, as of September, 1943, serves 228,575 residential customers in some 175 communities covering a large area of the state

	Interviews Made	Appliance Instructions Given	Repairs Made in Home	Appliance Repair Orders Turned In	Complaints		Fuse Renewal Instructions Given	Appliances Brought in for Repairs	Appliances Listed			Appliance Repairs Referred to Dealers
					Received	Completed			To Sell	To Buy	Sold	
Outside interviews	6,249	9,194	3,476	343	23	21	4,456	330	84	692	92	447
Floor interviews	4,101	728	425	190	1	0	194	853	146	332	153	604
Totals for month	10,350	9,922	3,901	533	24	21	4,650	1,183	230	1,024	245	1,051
Totals from February 1	56,947	62,072	23,962	3,651	503	.....	30,528	5,978	1,371	5,318	.....	3,937

No "SHADOWTAGE" here

"Shadowtage" means sabotage due to shadows on the working plane — especially when they blur delicate machining operations held to tolerances of 1/10,000th of an inch.

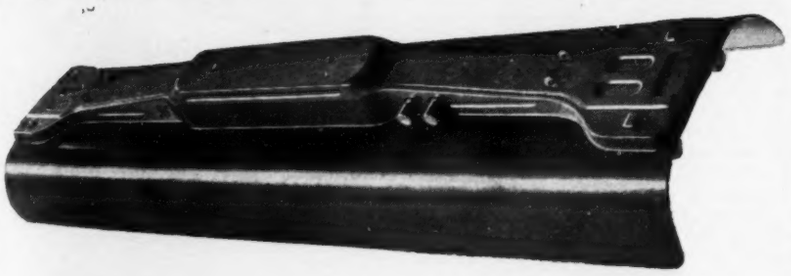
The best-known answer to "shadowtage" is the scientific installation of shadowless and glare-free fluorescent lighting.

It is our job to supply the fluorescent and incandescent lighting equipment that is helping to speed war production all over the country.

Aggressive and independent Sylvania research developed and introduced the first successful fluorescent installation — forerunner of war plant fluorescent by the thousands of miles of lamps today.

And now — years ahead of time — Sylvania is producing the fluorescent fixture of the future. A revelation in simplicity and adaptability, *one* standard fixture meets any industrial lighting requirement. Similar developments may bring economical fluorescent lighting into American homes after the war.

For industrial fluorescent lighting equipment, designed to work together, specify Sylvania Fluorescent Lamps, Fixtures and Accessories for replacements and authorized new installations.



THE FIXTURE OF THE FUTURE. This new fixture, which can challenge comparison with any other in the fluorescent field, is much more than a design to save critical war materials. Its non-metallic reflector has an efficiency of 86 per cent — actually more than that of enameled metal. The streamlined top housing, constructed like a cantilever bridge, encloses the ballast—protects it from dust—provides cooler performance.

SYLVANIA

ELECTRIC PRODUCTS INC.

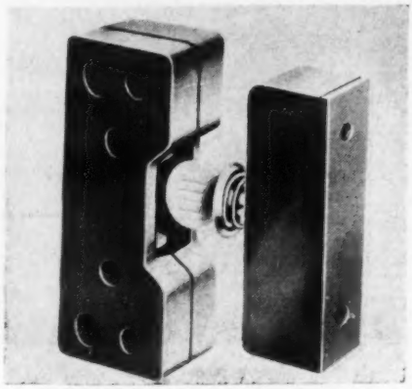
Formerly Hygrade Sylvania Corporation

Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Cathode Ray Tubes, Other Electronic Devices

NEW EQUIPMENT

Door Switch

Designed as an emergency device to interrupt control circuits where access doors are opened when power is on, the application of the interlock switch includes also windows or covers which must be interlocked for the protection of the equipment and safety of the personnel.

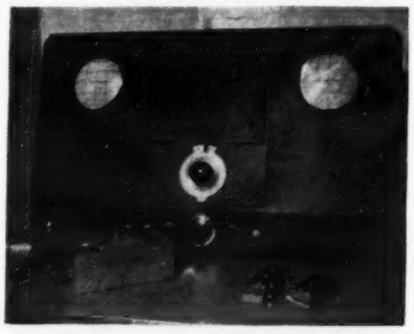


Door interlock switch; carrying capacity 10 amp., 110 or 220 volts, a.c. or d.c., emergency opening capacity of a.c. 7.5 amp., 110 or 220 volts; d.c. on low inductive circuits 5 amp. 125 volts; 2.5 amp. 250 volts. Electronics Department, **General Electric Co.**, Schenectady, N. Y.

•

Metallurgical Tester

An electronic device with 5-in. cathode-ray tube indicators has been designed to provide a visual means of checking and comparing known and unknown metallurgical items, as well as automatic sorting, by the use of several frequencies, either one after the other or simultaneously. By non-destructive means both ferrous and non-ferrous articles are tested when inserted in a suitable coil fixture contained in a box with a plug insert. The instrument measures the hysteresis and eddy current losses and the oscillogram varies in height to indicate metallurgical differences. The cabinet can be locked to prevent inexperienced tampering with the electronic mechanism.

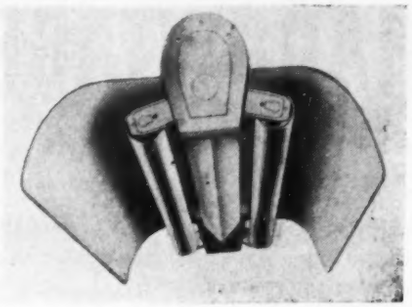


"Type 244" cyclograph; 250 watts, 115 volts, 60 cycles; range of frequency from 1,000 to 500,000 cycles. **Allen B. DuMont Laboratories, Inc.**, 2 Main Ave., Passaic, N. J.

•

Fluorescent Unit

An addition to the line of Generalite equipment is a unit for instantaneous starting; starting switches are eliminated. Lamps are said to operate without blinking for the satisfactory number of hours and then fail instantly. Wiring is in a V-channel. Finish inside and outside is glass white synthetic enamel. Output is approximately 4,200 lumens when using 3,500 deg. white lamps.



"Model MF-240-N" industrial lighting unit; accommodates two 40-watt fluorescent lamps; power factor 98 percent at 118 volts. **The Fostoria Pressed Steel Corp.**, Fostoria, Ohio.

•

Resistor Coating

"Lectraseel" resistor coil coating. **Pemco Corporation**, Baltimore, Md.

Vitreous coating is said to be a low-loss type and highly resistant to thermal shock. In the opinion of the manufacturer's engineers, its coefficient of expansion and contraction will, ninety-nine times out of a hundred, parallel that of ceramic cores now in use and meeting government requirements. Accelerated weathering tests indicate that a coil with the coating is immune to corrosion.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Phantom Load

New load unit has been developed to check watt-hour meters, with single-phase source. It has full load steps of 5, 10 and 15 amp., light load steps of 0.5 and 1.5 amp. and 50 percent power factor steps of 5, 10 and 15 amp., 120-240 volts.

"Type 1" phantom load; capacity, 5, 10 and 15-amp. watt-hour meters; dimensions 6⅞x6⅝x5 in.; weight 9½ lb. **The States Co.**, 3 New Park Ave., Hartford, Conn.

•

Electric Sealer

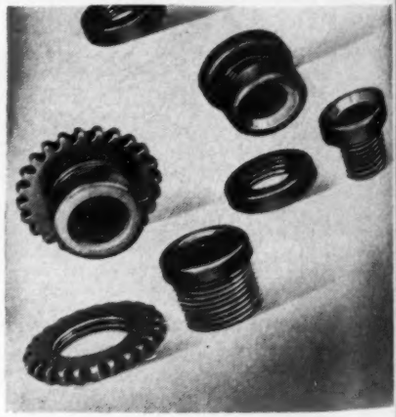
"Multi-Use" sealer; available with three-heat switch and 8-ft. cord; 110 volts, a.c. or d.c. **Pack-Rite Machines**, 828 N. Broadway, Milwaukee, Wis.

A new electric heat sealer which can be brought to the package has a flat blade and a spring clip for applying to heat-sealing materials. Three sealing stations are incorporated: (1) whisking the flat back of sealer over tops of bags, pouches, packages and labels, (2) applying the flat, heated tip for spot-sealing, and (3) slipping heat-sealing materials under the spring clip for pinch-type bands, ends of materials, tops of bags and envelopes.

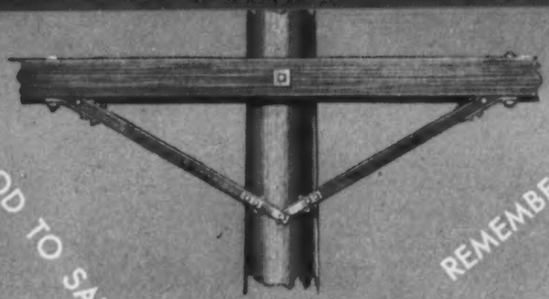
•

Grommets

New line of phenolic plastic insulating grommets has been developed for electronic, motor and radio use. Holes are concentric, with all corners chamfered to avoid wire chafing. Threads are clean and lubricated. All parts are matte finished to promote easy gripping and conservation of assembly time.



Plastic insulating grommets; four standard sizes. **Creative Plastics Corp.**, 970 Kent Ave., Brooklyn, 5, N. Y.



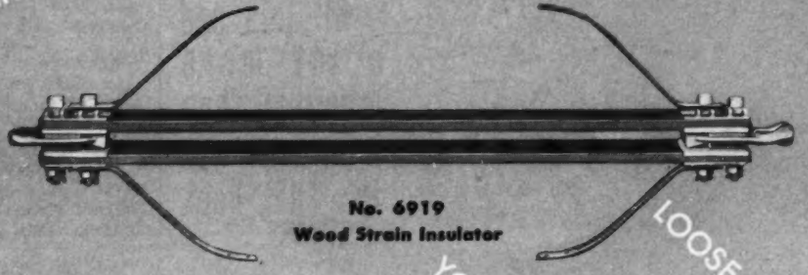
No. 5547
Wood Brace

No. 1358
Secondary Rack

No. 7753
Stubbing Band

No. 7328
Steelwing Anchor

No. 1330
Insulated Clevis



No. 6919
Wood Strain Insulator

No. 4-11-44
Wireholder

REMEMBER PEARL HARBOR!

BE CAREFUL—THE ENEMY IS LISTENING!

LET'S ALL DRIVE SAFELY!

WE HAVE JUST BEGUN TO FIGHT!

KEEP 'EM FLYING!

10% EVERY PAYDAY!

LET'S CLEAN IT UP IN '43!

BUY WAR BONDS AND STAMPS!

OIL IS AMMUNITION—USE IT WISELY!

LOOSE TALK SINKS SHIPS!

YOU'VE DONE YOUR BIT—NOW DO YOUR BEST!

UNITED WE ARE STRONG—UNITED WE WILL WIN!

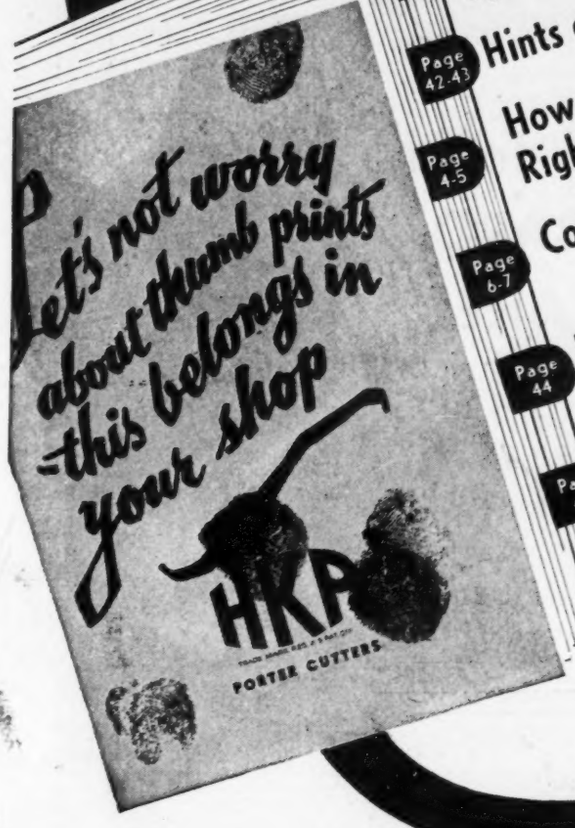
Hang the load on HUBBARD HARDWARE!

HUBBARD AND COMPANY

PITTSBURGH OAKLAND CALIFORNIA CHICAGO

BACK THE ATTACK WITH WAR BONDS!

Yours for the asking



Page 46-47 How to Prevent Breakage of Taps and Drills

Page 42-43 Hints on Hand Filing

Page 4-5 How to Choose the Right Bolt Clipper

Page 6-7 Correct Cutting Technique

Page 44 How to Use the Ball Pein Hammer

Page 48 Cutting Angles on High Speed Bits

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JUST SEND A POSTCARD - Ask For PORTER'S TOOL MANUAL

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PORTER CUTTERS

BOLT CLIPPERS — AUTOBODY REPAIR TOOLS — PRUNERS

H.K.PORTER, INC., 412 Ashland St., Everett 49, Mass.

TECHNICAL LITERATUR

INSULATION TESTERS—Subjects such principle of operation, variations in g erator voltage and voltage characteris also a diagram, curve and illustrations a new U. S.-made "Megger" insulation sistance tester, are presented in Bull No. 1735, available from James G. Bid Co., 1211 Arch St., Philadelphia, 7, Pa.

"WATT-HOUR METER REGISTRATION C CULATOR" of a slide-rule form enables to read percent registration of vari types of Sangamo, General Electric, W inghouse, Duncan and Ft. Wayne w meters from 1 to 50 amp. capacity. I obtainable from Sangamo Electric Springfield, Ohio.

"DEDUCT-O-GRAPH," a circular slide r automatically shows the payroll tax de tion for an employee when proper setti are made as to marital status, wage ra and pay period. The device may be tained from George S. May Company, North Shore Avenue, Chicago, Ill., requ to be made on business letterhead.

PLASTIC—Properties of various grade Dilecto, based on NEMA standards, sheet, rod and tube forms, also suggesti for machining and uses of the laminat phenolic plastic are contained in Cata DO—43, "Dilecto," obtainable from Continental-Diamond Fibre Co., Newa Delaware.

AMPLIDYNE—Engineering details such operating principles, fundamental fo tions and graphs and wiring connecti for typical applications are contained i 36-page bulletin, GEA-4053, "The Si Circuit—That Moves Mountains," iss by General Electric Co., Schenectady, N

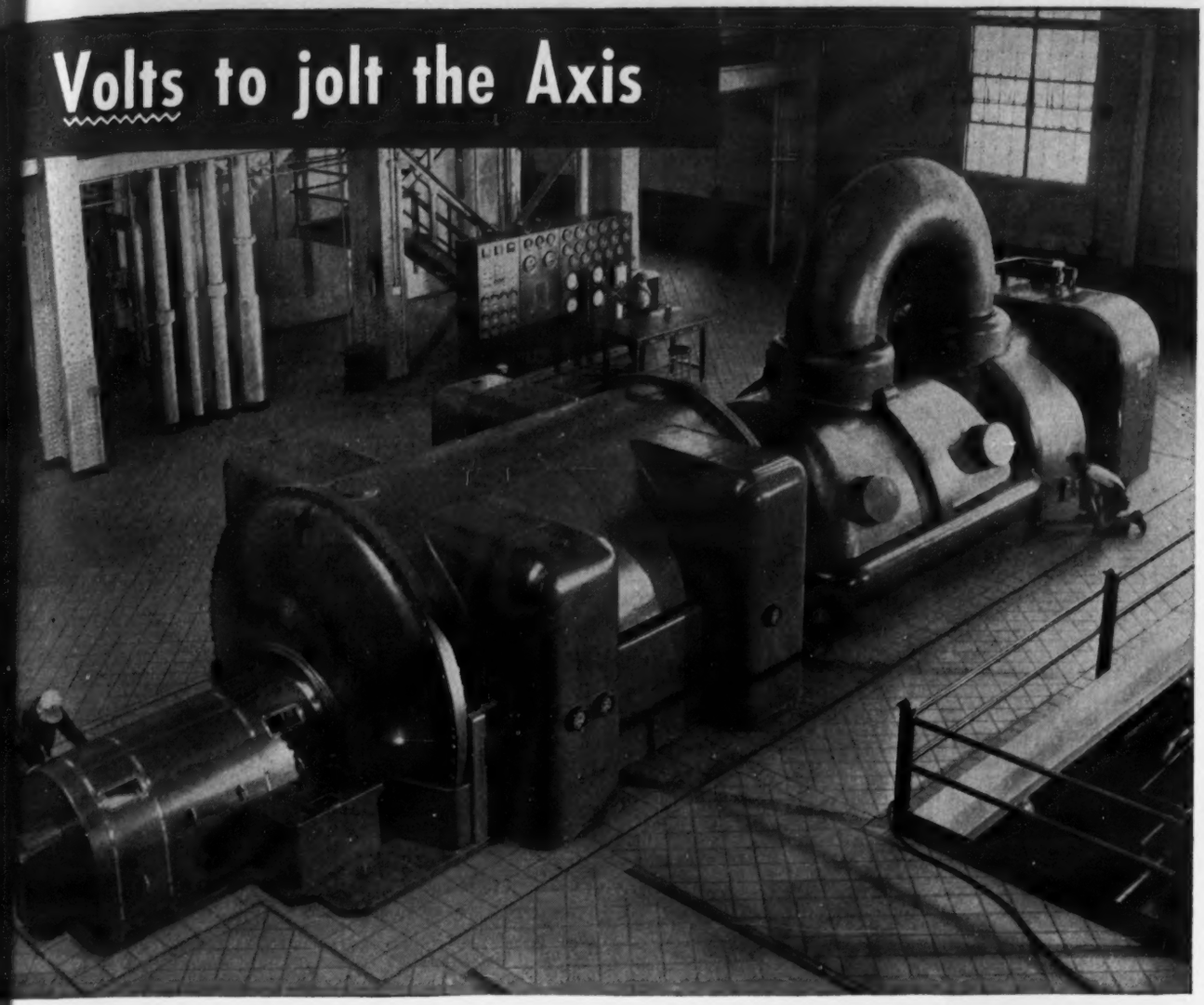
MOTORS AND GENERATORS—An outlin commutator troubles and remedies, h on commutator care, instructions for op tion of d.c. generators, as well as formu and tables and a listing of the compa products are contained in Handbook "Speed-up Tools and Equipment," a able from Ideal Commutator Dresser Sycamore, Ill.

PERMANENT MAGNETS—Fundamental c siderations of permanent magnet appl tions, comparative values with typical magnetization and energy product cur factors of design, physical characteris of cast Alnico are some of the subj covered in a 30-page booklet, "Perma Magnet Manual, No. 2," available from Indiana Steel Products Co., Valpara Ind.

FLOWMETERS—"How to Keep Flowm Accurate" is a practical presentation, w no waste words, outlining and illustra preventives and cures for meter ills. 8-page publication, Reprint No. 28, is a available by the Cochrane Corp., 17th Allegheny Ave., Philadelphia, 32, Pa.

MAGNETIC SEPARATORS—A 40-page h book contains information on trou shooting, trouble prevention, repa recommended operating practices and f eral maintenance of magnetic pulleys discussion of magnetic theory is include a background. Much of the informatio applicable also to other types of separat The publication, "Operation and Mai nance of Magnetic Pulleys," can be tained from Dings Magnetic Separator 7509 E. Smith St., Milwaukee, 7, Wis.

Volts to jolt the Axis



ONE of the reasons America's war production has grown in two ars to proportions that Hitler uldn't achieve in ten, is our vast, ailing output of electric power.

Throughout the nation, great power tions hum at full capacity day and ht, producing the electric energy t keeps our mines, mills, factories shipyards going . . . and on top of t. the power and light to keep our ilian life going, too.

Only electrical wires and cables of the utmost dependability can be trusted to transmit this vital energy. That is why we are proud of the important part played by American Steel & Wire Company products.

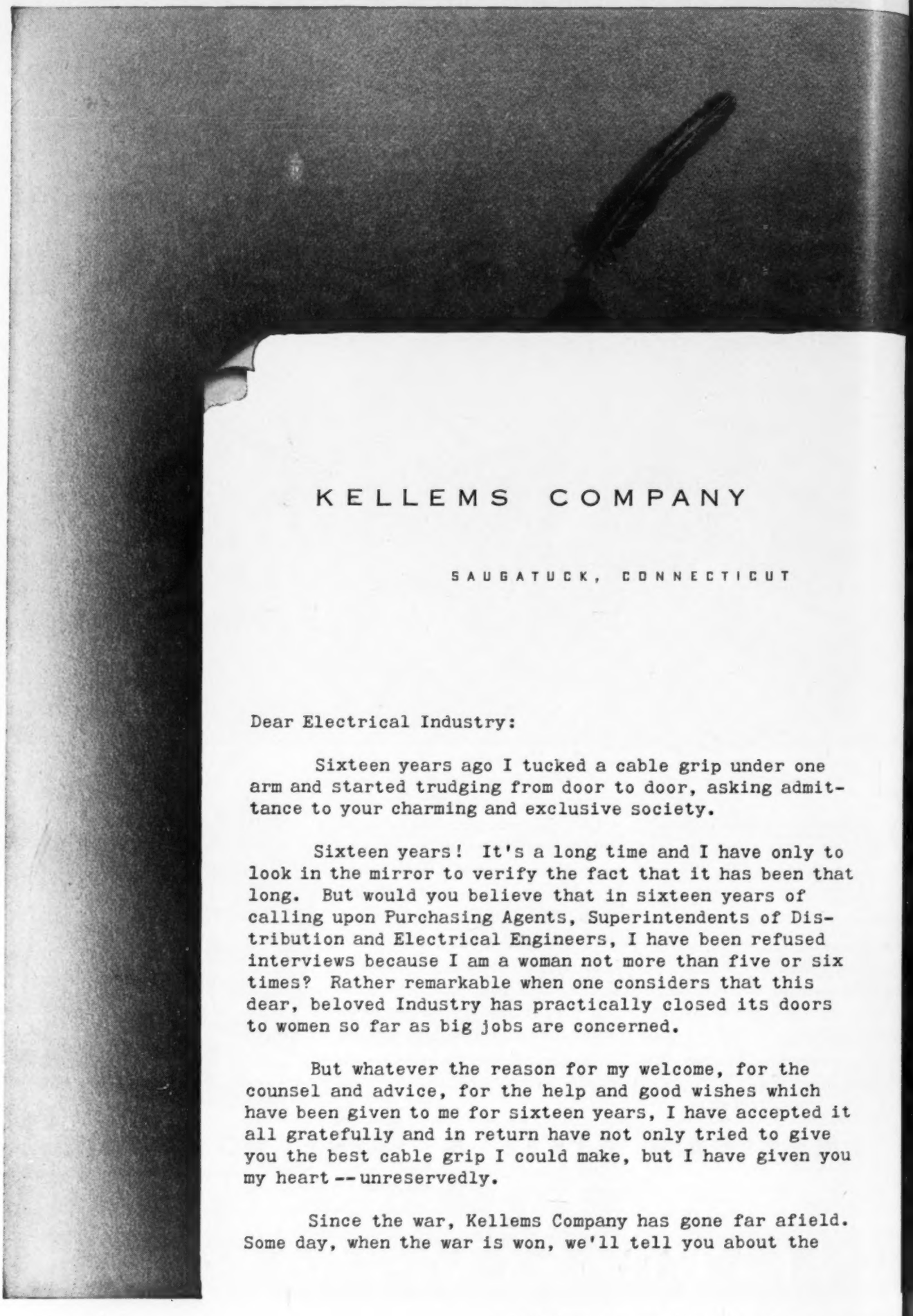
Our years of research are demonstrating their value now. And, looking toward the day when peace comes, our engineers continue their unceasing efforts to improve the quality of these products.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Export Company, New York

UNITED STATES STEEL



KELLEMS COMPANY

SAUGATUCK, CONNECTICUT

Dear Electrical Industry:

Sixteen years ago I tucked a cable grip under one arm and started trudging from door to door, asking admittance to your charming and exclusive society.

Sixteen years! It's a long time and I have only to look in the mirror to verify the fact that it has been that long. But would you believe that in sixteen years of calling upon Purchasing Agents, Superintendents of Distribution and Electrical Engineers, I have been refused interviews because I am a woman not more than five or six times? Rather remarkable when one considers that this dear, beloved Industry has practically closed its doors to women so far as big jobs are concerned.

But whatever the reason for my welcome, for the counsel and advice, for the help and good wishes which have been given to me for sixteen years, I have accepted it all gratefully and in return have not only tried to give you the best cable grip I could make, but I have given you my heart--unreservedly.

Since the war, Kellems Company has gone far afield. Some day, when the war is won, we'll tell you about the

interesting things which we are making to help in our small way, and some of these new grips can be applied to our own industry problems.

But no matter what new field we may go into, "my heart belongs to Daddy!" Which means you, dear Electrical Industry. You are my first love and my true love. And because I love you so much, it is my woman's prerogative to criticize and scold you a bit, here and there. All for your own good, you understand. And here it is:

> You have been ultraconservative about women. In spite of the fact that the great majority of your customers are women -- women who use and in most instances pay for electricity -- you have failed to properly woo them.
>
> And of this I shall write you more next time.

Sincerely yours,

Vivien Kellems

NEWS ABOUT PEOPLE

Utility Makes Electric Department Promotions

Announcement has been made by Jacob T. Barron, vice-president in charge of electric operation, Public Service Electric & Gas Co., Newark, N. J., of the following changes in the company's electric operating department:

Edwin H. Snyder, from assistant to the chief engineer to assistant chief engineer, electric engineering department,

E. H. Snyder

succeeding Walker L. Cisler, who resigned to take a position with the Detroit Edison Co. (ELECTRICAL WORLD, October 16, page 126).

Philip H. Hartung, from superintendent, Kearny generating station, to assistant general superintendent of generation, general office.

Richard S. Hopkins, from chief engineer, Kearny station, to superintendent, Kearny station; LeRoy A. Brown, from chief engineer, Perth Amboy generating station, to chief engineer, Kearny station, and Earl C. McMahon, from engineer to chief engineer, Perth Amboy station.

Mr. Snyder has been with Public Service since 1923, when he started as a cadet engineer, electric department, a few months after being graduated from Lehigh University. In 1926 he was assigned to the distribution engineer's office in Newark and later was placed in charge of a planning group in that office. In 1937 Mr. Snyder was promoted to assistant to the chief engineer in the electric engineering department.

Starting with the company in 1923 as a cadet engineer, following graduation from Lehigh University, Mr. Hartung was made assistant engineer at Kearny generating station in 1926; test engineer at Essex station three years later; fuel engineer, electric generation department in 1934; load schedule engineer in 1935; chief engineer at Kearny station in 1936, and superintendent there a year later.

Mr. Hopkins, upon being graduated from Stevens Institute of Technology, started with Public Service in 1919 as a cadet engineer. Since that time he has served at the Burlington, Essex and Kearny stations. A graduate of Lehigh University, Mr. Brown also entered the utility's employ as a cadet engineer in 1926. He was assigned to the Essex station in 1929 and subsequent appointments followed at Kearny and Perth Amboy. A graduate of Massachusetts Institute of Techology, Mr. McMahon started with Public Service in 1926 and has served at Kearny and Perth Amboy.

•

F. M. Sutherland Assumes New Executive Duties

F. M. Sutherland, formerly manager of the transportation department of the New Brunswick Power Co., St. John, N. B., Canada, has been appointed first vice-president and general manager of that utility.

Mr. Sutherland succeeds W. P. Southard, who recently resigned when Federal Light & Traction Co., New York, sold control of the New Brunswick utility to the Public Service Corp., Halifax, N. S. Mr. Southard remained with Federal Light & Traction. Mr. Sutherland was in the banking field until 1915. In 1932 he became maritime provinces manager for the Goodyear Tire & Rubber Co. and held that position when he was appointed transportation manager for New Brunswick Power Co. a year and a half ago.

Copperweld Announces Organizational Changes

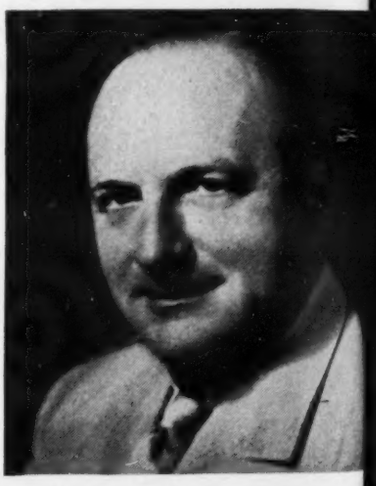
In recent organizational changes, the Copperweld Steel Co., Glassport, Pa., announced the appointment of William W. Ege as general manager of sales, succeeding W. J. McIlvane, now executive

W. W. Ege

tive vice-president. Mr. Ege was formerly western sales manager, Chicago.

Paul Van Wagner, at present vice-president in charge of export sales, is succeeded by Henry Oberle, who assumed the duties of eastern sales manager. Prior to his recent appointment Mr. Oberle was with the Queensborough Gas & Electric Co.

P. A. Terrell left the Washington



P. Van Wagner

office to take up his new duties as assistant to the executive vice-president.

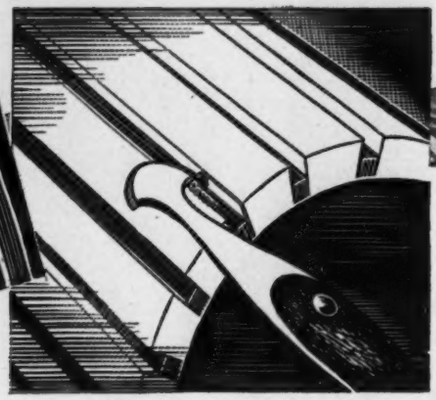
Erich G. Elg was assigned to the position of western sales manager, succeeding Mr. Ege.

•

▶ THOMAS A. ABBOTT, formerly manager of sales, meter division, Gen

The A B C of Good Commutation and Electrical Machine Performance

● Serious shutdowns and consequent delays in the production and delivery of urgently needed materials can be avoided by observing these simple precautions in the maintenance of motors, generators and converters. Under present conditions, dependable and uninterrupted performance of electrical power equipment is of utmost importance. Keep your machines in readiness to deliver full output at all times.



Keep Commutators and Rings Clean

Cleanliness is of paramount importance in the continuous operation of brush-using equipment. Time spent on keeping commutators, rings, brush holders and rigging free from dust, dirt, oil and film pays dividends. Use a suitable canvas wiper frequently on commutators and rings. Keep them clean and keep them running.

Keep Undercut Commutators Free from Side Mica

Thin edges of mica along the sides of slots of undercut commutators are a frequent source of trouble. Special care should be taken to inspect each slot carefully and to remove all side mica when undercutting commutators. Bad sparking and serious commutator burning can be avoided by observing this precaution.

Keep Brush Pressure Uniform and Correct

The spring pressure applied to brushes has a marked influence on brush performance. Equal distribution of current among all brushes requires that the pressure on all brushes be kept as nearly equal as possible. Check brush pressure frequently and adjust it to compensate for brush wear. Use pressures recommended for the grade of brush and class of service in which it is used.

MODERN PYRAMIDS will tell you more

This series of bulletins contains practical information on Commutation, Brush Operation and Machine Maintenance to help conserve present equipment and to keep it in continuous and efficient operation. If you are not receiving these bulletins write us direct or contact your National Carbon representative.

The services of our engineering staff are available for the proper selection and application of "National" Carbon Brushes on all types of equipment and for every class of service.

NATIONAL CARBON COMPANY, INCORPORATED

Unit of Union Carbide and Carbon Corporation

UCC

Carbon Products Division, Cleveland, Ohio • • GENERAL OFFICES: 30 East 42nd Street, New York, N. Y.

Branch Sales Offices: NEW YORK • PITTSBURGH • CHICAGO • ST. LOUIS • SAN FRANCISCO

Electric Co., Schenectady, is now connected with the Kellex Corporation, New York, N. Y., in an engineering capacity.

► OTTO H. ADAMS, general superintendent of municipal utilities at Fort Wayne, Ind., since 1939, has been appointed by Mayor Harry W. Baals to succeed the late Louis F. Crosby as city controller. Mr. Adams had previously served with the transportation system of the Indiana Service Corp. for 25 years before joining the municipal utilities.

► A. C. WEIGEL, vice-president Combustion Engineering Co., Inc., New York, N. Y., was elected second vice-president of the American Welding Society at the recent annual meeting in Chicago. In addition to being a member of the society and its executive committee, Mr. Weigel is also a member of the A.S.M.E. boiler code committee, the Newcomen Society and other technical societies.

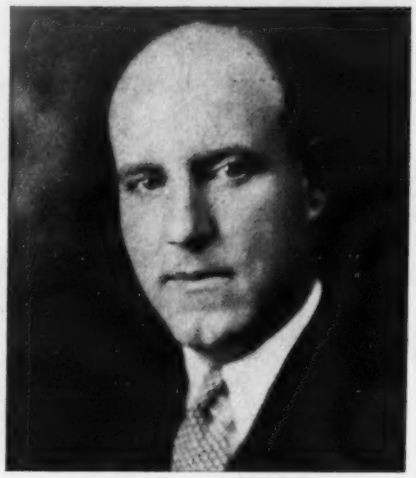
► W. A. GROVE, for 15 years director of advertising and sales promotion, Edison General Electric Appliance Co., Chicago, has joined the firm of Addison Lewis & Associates, Minneapolis advertising agency, as an account executive for Minneapolis-Honeywell Regulator Co., and other accounts. Before joining Hotpoint Mr. Grove was connected with the Curtis Publishing Co. as advertising sales representative for the *Saturday Evening Post* in the Chicago territory. Mr. Grove is widely known throughout the home appliance industry because of his active participation in association and industry promotional activities. He has twice served as chairman of the plan committee of the Modern Kitchen Bureau and for five years was chairman of the advertising committee of the electric range section of the National Electrical Manufacturers Association. He is also a former director and vice-chairman of the Association of National Advertisers.

► JOSEPH F. PORTER, JR., vice-president of the Kansas City Power & Light Co., Kansas City, Mo., has resigned as an industry member of the War Labor Board because of the demands on his time by other business and civic activities. In accepting his resignation the members of WLB presented him with a resolution, indicating their high regard for Mr. Porter's ability. The resolution read in part: "Mr. Porter's willingness, judgment and experience have been extremely valuable to the board in its administration of the wage stabilization policies and the deciding of labor disputes, and his membership has added much distinction and prestige to the board. The members of the board are reluctant to see him leave, and it is only because of the realization of the importance of the other activities in which he is engaged that he is not asked to reconsider his resignation. The board shall not forget his promise to reassociate himself if ever he has the time to do so."

•

Calhoun Elected President of Edwin L. Wiegand Co.

Directors of the Edwin L. Wiegand Co., Pittsburgh, Pa., at their recent annual meeting, elected Ernest N. Calhoun president. Edwin L. Wiegand, who founded the company 28 years ago,



becomes chairman of the board. A. P. Wiegand was elected senior vice-president in charge of manufacturing.

Mr. Calhoun joined the company in 1922 as a salesman and has held the offices of treasurer and general sales manager.

•

► MARGARET DAVIDSON, formerly household equipment editor of the *Ladies' Home Journal*, has been appointed director of home economics for the Edison General Electric Appliance Co., Chicago. Miss Davidson directed editorial work in the kitchens, laundry and laboratory of the household department of the *Journal* and wrote articles on related subjects. Previous to her connection with the *Journal* Miss Davidson was home service director for the Cleveland Electric Illuminating Co., Cleveland, Ohio. She was also a member of the editorial staff of *Delineator Magazine*. Miss Davidson is a graduate of Iowa State College.

► ISAAC HARTER, vice-president of the Babcock & Wilcox Co., Barberton, Ohio, was elected first vice-president of the American Welding Society at the recent annual meeting in Chicago. Mr. Harter was closely associated with the beginnings of the A.S.M.E. boiler co and the corresponding code of the st of Ohio, and with the acceptance by t U. S. Navy of welding for its pressu vessels.

► C. B. KELLEY has been appoint electrical engineer of power plants the Kansas City Power & Light C Kansas City, Mo., to succeed R. L FRISBY, retired. Mr. Kelley first start to work for the company in 1913 in t substation construction department. H remained there until 1917, when h left to go into war work. Returning t Kansas City, Mr. Kelley went to wor on the Northeast powerhouse constru tion job. In 1927 he was made assistan electrical engineer of power plant with his office in the Northeast station. Before leaving for his native state, Ind ana, Mr. Frisby was the guest of hono at a banquet attended by nearly hundred associates he had known an worked with, some for approximately quarter of a century. Announcement o Mr. Frisby's retirement and details o his career were published in the Sep tember 25, 1943 issue of ELECTRICA WORLD.

OBITUARY

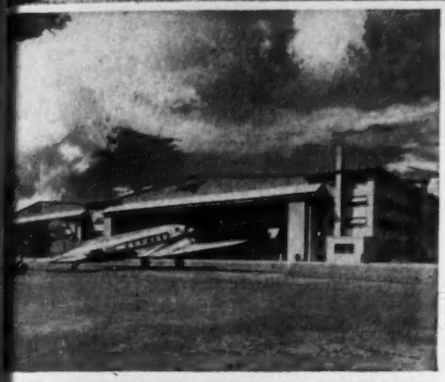
John G. Learned

John G. Learned, vice-president the Public Service Co. of Northe Illinois, Chicago, died, of a heart attac on October 23, at the age of 64.

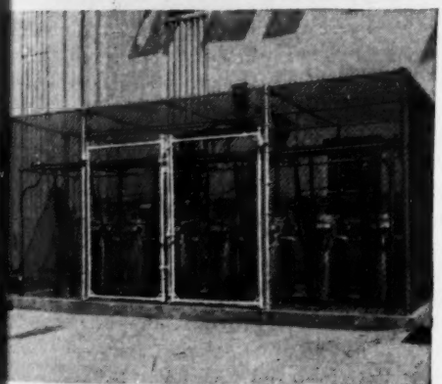
Mr. Learned was born in Chica and was graduated from Chicago La School in 1902. He began his care in the public utility field in 1898 wi the Chicago Telephone Co., now t Illinois Bell Telephone Co. On lea ing that company, two years later, h became a salesman for the Commo wealth Edison Co. In 1905 he re signed from the Commonwealth Edis Co. to join the North Shore Electric C as general contract agent, where he re mained until 1911, when the compan became a part of the Public Service C of Northern Illinois. At that time h was made general contract agent fo the northern and western divisions an the following year was appointed a sistant to the vice-president of the com pany in charge of the commercial, ad vertising and right-of-way department Later he became commercial and new business manager. It was in 1923 tha he assumed the duties of vice-presidet

During his association with the Ch cago utility Mr. Learned was active the affairs of the old National Electri Light Association, having served chairman of the committee on electri service in rural districts, as first chai man of its lighting sales bureau, chai man of the commercial section and as

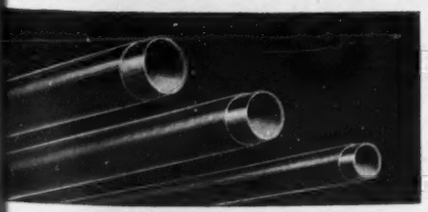
How to Protect an Airport's "NERVOUS SYSTEM"



PAN AMERICAN WORLD AIRWAYS' new million dollar hangar, maintenance and office building at Pan American Field, Miami.



TRANSFORMER EQUIPMENT providing electrical service to buildings, control tower, runways, beacons marking field boundaries.



• An airport's "nervous system" consists of the miles of cables and wires that carry light, power, and signal services to its "nerve centers"—the control tower, field boundaries, runways, hangars and other buildings.

What is the best way to protect this "nervous system" to guarantee uninterrupted supply of these vital services? The answer is to run the cables and wires underground — housed in Orangeburg Conduits.

Latest airport development to use this approved method of complete cable protection is Pan American World Airways' new hangar, maintenance, and office building at Pan American Field, Miami, Florida—the world's largest international air gateway.

Here are some of the important advantages of Orangeburg Conduit: Light weight. Ease of handling. Workability. Consequently, rapid installation. Ease of cable pull. No scoring or damaging of cable sheath at points of contact. No infiltration of corrosive elements at any point of line. Tapered sleeve coupling provides tight joints with perfect alignment of raceways.

ORANGEBURG STANDARD CONDUIT
for Installation *with* Concrete Encasement

•

ORANGEBURG NOCRETE CONDUIT
for Installation *Without* Concrete Encasement

THE FIBRE CONDUIT COMPANY • ORANGEBURG, NEW YORK

Distributors:

GENERAL ELECTRIC SUPPLY CORP. • GRAYBAR ELECTRIC CO., INC.

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ORANGEBURG

WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.

RELIABLE Connectors

Save Time

by using solderless connectors with accurately fitting precision threads which insure easy, permanent installations.

Save Copper

by using these connectors which are good as new after being salvaged.

EASY TO INSTALL
LOW IN COST

Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES

member of that section's executive committee and chairman of its membership committee. In the course of his career Mr. Learned contributed a number of valuable papers and articles to the commercial literature of the electrical industry.

•

L. L. Elden

Dr. Leonard L. Elden, 75, retired head of the electrical engineering department, Boston Edison Co., and president of the Association of Edison Illuminating Companies in 1918-19, died at the Tobey Hospital, Wareham, Mass., on October 21. He was born in Buxton, Me., and entered the employ of the then Massachusetts Electric Power Co., Boston, in 1885. Three years later, when this organization was absorbed by the Merchants Light & Power Co., Boston, he was placed in charge of electrical station equipment, a position which he soon filled with the newly formed Boston Electric Light Co. When that utility was acquired by the Edison Electric Illuminating Company of Boston Mr. Elden became superintendent of the electrical engineering department and ultimately technical adviser to the general superintendent, the late W. H. Atkins.

Dr. Elden retired in 1932 after 47 years of distinguished service to the utility industry, during which he had been on many committees of the N.E.L.A. and A.I.E.E., and also a committee member of the International Electrotechnical Commission and American Engineering Standards Committee. His contributions to the electrical field also included the invention of a composite type air circuit breaker, oil circuit breaker and other oil breaker switches. The honorary degree of doctor of science was conferred upon him by Tufts College in 1929.

•

George F. Morrison

George F. Morrison, an honorary vice-president of the General Electric Co., and a member of its board of directors, died at his home in East Orange, N. J., after a long illness. He was 76 years of age. Mr. Morrison was one of the pioneers in the manufacture of incandescent lamps. Entering the business in 1882 as an employee of the Edison Lamps Works at Harrison, N. J., at the age of sixteen, he quickly rose in the ranks, learning the lamp business in all its phases. The great expansion of the lamp business took place while Mr. Morrison was works manager and he took a leading part in the stabilization of the lamp industry and in the standardization of lamp equipment.

The Edison Lamp Works became a part of General Electric in 1893, and in 1900 Mr. Morrison was made works manager. He was elected vice-president of General Electric in 1916 and a director in 1922. Upon his retirement from active service in 1928 he was named honorary vice-president.

•

▶ RAYMOND E. DRESSER, 58, an engineer in the distribution transformer section at the Pittsfield, Mass., works of General Electric Co., died suddenly in that plant, of a heart attack, on October 11. He had been in the company's employ since 1920.

▶ CHARLES D. PATERSON, once an assistant to the late Thomas A. Edison, died at his home in Worcester, Mass., on October 19, at the age of 77. Mr. Paterson worked with Mr. Edison in Schenectady, N. Y., between 1888 and 1895. He was formerly superintendent of the cable works of the General Electric Co. in Schenectady and later was associated with the Western Electric Co. in Elizabeth, N. J. Mr. Paterson was born in Troy, N. Y., and had lived in Worcester for the past 25 years. He retired eighteen years ago. He had been associated with the Norton Co. and the Heald Machine Co. in Worcester.

▶ LEWIS BURRAN, formerly electric engineer for the Quebec Railway, Light, Heat & Power Co. and the Quebec Power Co., died recently. Mr. Burran was associated with the Canadian Electrical Association in its early years.

▶ PATRICK M. CULLEN, 55, production supervisor at the River Works of General Electric in Lynn, Mass., on an important war job, and who had been with the company for 33 years, died at Lynn on October 18.

▶ FRANK W. REITER, who served for twelve years as director of the municipal light and water plant at Napoleon, Ohio, died on October 15, of a heart attack. He was 80 years of age.

▶ JOHN H. RODDEY, superintendent of the operating department of Duke Power Co., at Charlotte, N. C., died in that city on October 18, after a short illness. Following a connection with General Electric Co. at Schenectady, Mr. Roddey went to Charlotte in 1906, where he became associated with the Southern Power Co., a subsidiary of Duke Power, and later consolidated with the Duke organization. He took over the position of superintendent of operations in 1907, the year the position was created.

for THIS battle, G.H.Q. is at YOUR own desk!

★ Here's how you—yes, YOU—can carry out a smashing "pincer movement" against the Axis. Swing in on one flank with increased production of war goods! Drive in on the other with redoubled purchases of War Bonds through your Pay-Roll Savings Plan!

You're an officer in both of these drives. Your personal leadership is equally vital to both. But have you followed the progress of your Pay-Roll Savings Plan as closely as you have your production?

Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

LET'S KEEP ON Backing the Attack!

This Space is a Contribution to America's All-Out War Effort by

ELECTRICAL WORLD

MANUFACTURING-MARKETS

Prepared for Quick Post-War Changes

Completion of plants for the reconversion of Westinghouse facilities will enable the company to resume manufacture of electric appliances "within a few weeks after the war," A. W. Robertson, chairman of Westinghouse Electric & Manufacturing Co., declared last week.

Westinghouse officials feel, Mr. Robertson said, that the necessary readjustment period should be no more difficult than the nation's adjustment to wartime conditions, that the pent-up demand for goods will be unprecedented and that purchasing power will exist as never before.

No revolutionary changes in design in electric appliances are anticipated during the first year of peace, Mr. Robertson stated. This branch of the industry, he continued, will be concerned chiefly in meeting the public's immediate demands.

"Our planning," Mr. Robertson explained, "is being done with the aim to keep our expanded production capacity occupied after the war, so far as possible, so that we can provide work for the greatly increased numbers the company employs."

Employment exceeds 106,000 today, compared with a pre-war figure under 50,000, while production is about four times the average pre-war rate.

•

Pilot Plant for Impregnation Formulas

Announcement has been made that the Connor-McCorkle Corporation of Clinton, Mass. is equipped to do, on a pilot plant basis, certain types of impregnation work, particularly where such a service will assist in the determination of correct formulations.

The company has for some time been analyzing the problem of impregnation. Speed, uniformity and penetration depth obtained in impregnating materials for electrical purposes, primarily where the hot-type saturant is used, have been found not to be limited by saturant viscosity, speed of process, and temperatures alone, but may be increased by the proper use of certain additives.

•

G.E. Sales Increase 50% This Year

General Electric Co.'s net sales billed (representing shipments—by far the larger portion of which are war products) for the first nine months of 1943 amounted to $980,226,836 compared with $654,882,607 for the same period of 1942, an increase of 50 percent. Profit available for dividends during this period was substantially the same as for the corresponding period a year earlier, amounting to $31,433,933, or $1.09 a share of common stock, compared with $30,710,499 or $1.06 a share, respectively.

Total earnings of General Electric employees for the first nine months of this year amounted to $345,000,000, compared with $271,000,000 for the same period of last year, an increase of 27 percent.

•

Alcoa Merger Planned

A meeting of stockholders of the Aluminum Co. of America has been called for November 12 to vote on a plan whereby Aluminum Manufactures, Inc., would be merged into the Aluminum Co. of America and the issued common stock of the Aluminum Co. of America would be converted on the basis of three shares for one. The preferred stock of Aluminum Manufactures, Inc., would be exchanged share for share for the preferred stock of Alcoa.

•

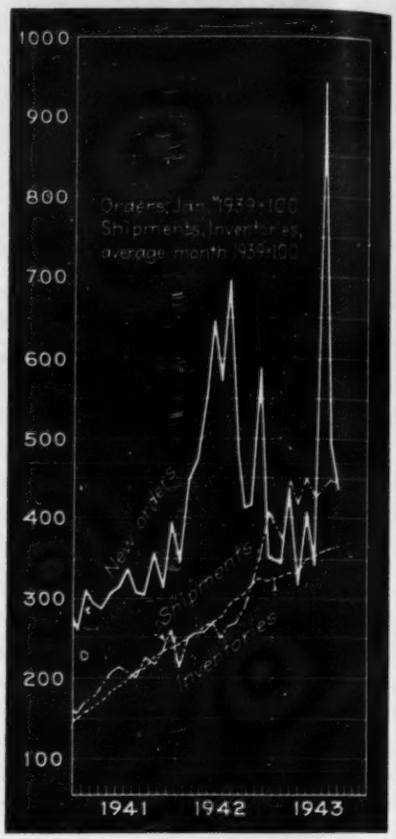
Ferranti Electric Moves

Ferranti Electric, Inc., has moved into new offices in the RCA Building, where it now occupies double the floor space that it formerly covered.

Electric Machinery Orders Decrease

New orders received by electrical machinery manufacturers during the month of August declined, according to figures released by the Bureau of Foreign and Domestic Commerce. The index compiled by the Bureau dropped to 435 from 496 (revised) in July, comparing with 491 in August, 1942.

Electrical machinery shipments



ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce

dropped slightly in August to 445 from 449 (revised) in July. In August, 1942, this index stood at 268.

The index of electrical machinery inventories advanced from 362.8 (revised) in July to 366.5 in August and compares with 299.9 in August, 1942.

•

Formica Reports 10-Month Backlog on War Orders

Formica Insulation Co., Cincinnati, has a backlog on orders, covering approximately ten months' future production now being maintained at the highest level in company history, D. J. O'Conor, president, reports.

September orders exceeded shipments and caused a rise in backlog, despite the plant's "all out" production, he said.

Manufacturers Make Sales Assignments

Cutler-Hammer, Inc., Milwaukee, Wis., has appointed W. E. Addicks as manager of the New York district office. In his new position, Mr. Addicks will have direct supervision of sales for the company in the entire New York sales territory. Prior to his new appointment he was in charge of the Boston sales office. C. V. Topliffe has been made manager of the Boston district office to succeed Mr. Addicks, with whom he has been associated in the Boston area.

Edison General Electric Appliance Co., Chicago, has recently announced the creation of two new field sales executive positions. A. A. Borgemenke, formerly sales manager of the New York and Philadelphia districts, has been appointed sales manager of the eastern region with headquarters in New York. The eastern region includes the sales districts of Boston, New York and Philadelphia. Walter H. Bondurant, formerly sales manager of the Cleveland district, has been appointed sales manager of the central region with headquarters in Chicago. The central region will comprise the Cleveland, Chicago, Kansas City districts.

•

Army-Navy "E" Awards

Renewal of the Army-Navy "E" award to the Thomas & Betts Co., Elizabeth, N. J., has been announced. This is the third war production award received by the company.

For the second time in less than a year, the Sprague Specialties Co., North Adams, Mass., has won the Army-Navy production award.

Nine Westinghouse plants have received renewals of their Army-Navy "E" awards, George H. Bucher, president, Westinghouse Electric & Manufacturing Co., recently announced.

Hazard Insulated Wire Works, Division of The Okonite Company, has received its second six-month renewal of the "E" award.

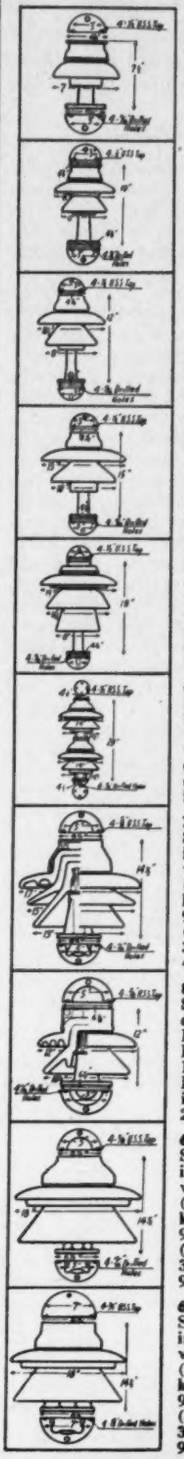
•

G. E. Homemaking Booklets

Five new wartime homemaking booklets have been added to the series of nine recently released by General Electric's Consumers Institute.

The titles of the new booklets are "Home Canning Made Easy," "Short Cuts to Fine Laundering," "Know Your Home Wiring," "Pack a Lunch that Packs a Punch" and "Frozen Foods—How to Prepare, Freeze, Package, Cook."

Pinco Switch and Bus Insulators



6075—N.E.M.A. Standard B.I.L. rating 7.5 kv. Flashover volts, dry, 60 kv.—wet, 40 kv. Leakage distance 7.5 in. Torsion strength, 6,000 inch pounds.

6015—N.E.M.A. Standard B.I.L. rating 15 kv. Flashover volts, dry, 85 kv.—wet, 55 kv. Leakage distance, 12 in. Torsion strength, 7,000 inch pounds.

6023—N.E.M.A. Standard B.I.L. rating 23 kv. Flashover volts, dry, 110 kv.—wet, 75 kv. Leakage distance, 20 in. Torsion strength, 8,000 inch pounds.

6034—N.E.M.A. Standard B.I.L. rating 34.5 kv. Flashover volts, dry, 145 kv.—wet, 100 kv. Leakage distance, 28 in. Torsion strength, 10,000 inch pounds.

6046—N.E.M.A. Standard B.I.L. rating 46 kv. Flashover volts, dry, 170 kv.—wet, 125 kv. Leakage distance, 36 in. Torsion strength, 12,000 inch pounds.

6069—N.E.M.A. Standard B.I.L. rating 69 kv. Flashover volts, dry, 235 kv.—wet, 180 kv. Leakage distance, 52 in. Torsion strength, 15,000 inch pounds.

735—N.E.M.A. Standard B.I.L. stacking unit. Flashover volts, dry, 160 kv. (single unit) to 660 kv. (stack of 6)—wet, 95 kv. (1) to 560 kv. (6). Leakage distance 33in. Torsionstrength, 40,000 inch pounds.

891—N.E.M.A. Standard B.I.L. heavy duty stacking unit. Rating 15-23 kv. Flashover volts, dry, 115 kv.—wet, 70 kv. Leakage distance, 18 in. Torsion strength, 20,000 inch pounds.

6095—N.E.M.A. Standard B.I.L. stacking unit. Flashover volts, dry, 160 kv. (single unit) to 745 kv. (stack of 7)—wet, 95 kv. (1) to 665 kv. (7). Leakage distance, 33in. Torsionstrength, 90,000 inch pounds.

6097—N.E.M.A. Standard B.I.L. stacking unit. Flashover volts, dry, 160 kv. (single unit) to 830 kv. (stack of 8)—wet, 95 kv. (1) to 755 kv. (8). Leakage distance, 33in. Torsionstrength, 90,000 inch pounds.

PINCO INSULATORS

A Shortened Line

(Types allowed under WPB Limitation Order L154 Schedule V)

But Still "Long" On "Right On the Job" Service

Gentlemen:

We appreciate the very excellent service which you so willingly gave us in connection with these insulators.

As a matter of information, the shipment to destination got there without a hitch and certainly pulled us out of a tight spot.

Very truly yours,

IN order to save strategic materials the long line of Pinco Switch and Bus Insulators has been shortened to the ten most widely used and adaptable units. For the duration this will be our "complete" line of Switch and Bus Insulators.

But, though there are fewer units in the line, there has been and will be no lessening of Pinco standards for "right on the job" service.

These units will be stocked at Pinco warehouses so that you can be sure of the insulators you need "right on the job."

Pinco High Test Porcelain and precision assembly combine, now as always, to assure the protection, ease of installation and interchange ability of units that make these insulators "right on the job."

*An unsolicited letter from a Pinco customer typical of many in our files that prove what "*right on the job*" service means to users of Pinco Insulators.

THE PORCELAIN INSULATOR CORPORATION

647 MAIN STREET • LIMA, NEW YORK

Pinco Standard Insulators are cataloged in the Electrical Buyers' Reference.

SALES AGENTS—The Joslyn Company—New York, Rochester, Philadelphia, Baltimore Washington, Richmond and Lynchburg, Va.; Jobbers Supply Co.—St. Paul, Portland, Seattle; Joslyn Co. of California—Los Angeles, San Francisco, Phoenix, Ariz.; Southern Joslyn Co.—New Orleans, H. E. Burns Co.—Pittsburgh, J. J. Costello—Boston; Southeast Joslyn Company—Cincinnati, Cleveland, Westerville, O., Lexington, Ky., Atlanta, Jacksonville; Paul Dauber—Denver, Paul Corson—Amarillo, Texas; Joslyn Manufacturing & Supply Co.—Chicago, Springfield, Ill., Kokomo, Ind., Kansas City, Omaha, Oklahoma City; Joslyn Southwest Co.—Dallas, Houston.

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• The Sturdee Solid Shank Telegraph Shovel is forged in one piece from a solid bar of steel.
It is exclusive in construction —the strongest shovel known.
America's largest shovel users —railroads, mills, mines—specify, use and universally acclaim Solid Shank as first in utility, service life and economy.
Every light, power, and communications user who has tested this shovel now standardizes on Sturdee Solid Shank—they will have no other.
Reduced costs will follow if you specify Sturdee Solid Shank for all telegraph shovels.
STURDETOOLS
a TRUE TEMPER PRODUCT
Cross-section at right illustrates the solid shank, one piece construction of Sturdee Telegraph Shovels. 22 inch, straight handle socket. 13 gauge, heat treated blade. XX grade hickory or ash handle, sanded and waxed. Length 6 feet to 12 feet.
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Field Reports on Business

Heavy industries are continuing to operate at the high levels recently attained. Large quantities of wiring materials are moving into shipyards for use in power and light installations on vessels. Electric cooking equipment is featured prominently on Navy schedules. Construction continues to decline.

NEW ENGLAND

Boston & Maine R. R. has ordered twelve 5,400-hp. Diesel-electric General Motors locomotives for main line service. Thirty-two specially designed fans to handle over 1,000 tons of air per hour for ventilating and cooling generating equipment at the TVA Kentucky Dam have been ordered from B. F. Sturtevant Co., Hyde Park, Mass. Large quantities of wiring materials are moving into local shipyards for use in power and light installations on vessels. A Connecticut manufacturer has bid on more than 600,000 lamps for naval vessels. Electric cooking equipment is featured prominently on Navy schedules, among which are noted electric toasters, cookers and water heaters. A Connecticut manufacturer of electrical equipment has submitted bids on more than $50,000 worth of plastics, including utensils, trays and covered containers, and another interesting order calls for the delivery of more than 2,000 heating elements to local shipyards.

The city of Boston has purchased about $2,000 worth of incandescent lamps for its institutions. Aerovox Corp. has received awards for Dykanol by-pass condensers, and about $10,000 worth of friction tape has been sold to the Navy by Plymouth Rubber Co., Canton, Mass. Western Electric Co. is to open a new manufacturing plant at Haverhill, Mass., and will employ about 2,000 in the production of communication equipment. Ralston-Purina Co., Belfast, Me., is installing a second 20,000-egg incubator, electrically operated. Over 2,000 all-electric homes are now being built, mainly for war plant workers, in the Bridgeport, Conn., district of United Illuminating Co. Stanton Electric Co., Boston, is installing new lighting fixtures in the South Ferry Terminal.

Electrical energy consumption in Connecticut gained 10 percent in September over a year ago in the four leading utility systems.

PACIFIC COAST

To date the three Pacific Coast states have been awarded 13.5 percent, or $19,170,289,000, of the national value of contracts for major war supplies and facilities, California with 10 percent ranking second to Michigan. However, occasional cancellations are being reported which, as in southern California plane plants, may be due to changed designs but which are bound to cause considerable repercussions. One cancellation in the Bay area, for example, involved 6,000,000 lb. of steel and 5,500,000 board-feet of lumber.

New industrial methods are adding new electrical loads, such as 200 kw. in Stockton area for infra-red rapid drying of steel drums and a considerably larger load for other purposes for nearby Army air depot. New meat and food packing plants at Seattle and Lewiston are reported. Dehydrating plant construction is apparently nearly completed and is being replaced as a building source by cold storage warehouses, of which about 300 are scheduled for early construction in the West.

Orders include 280 motors, value $20,000, sizes one to 5 hp., for pressure pump systems; $65,000 lot of transformers, circuit breakers and controls for Navy base installations, and a $210,000 order of G. E. motors and controls.

Despite early gloomy predictions due to threatened labor shortage, California will apparently exceed its billion-dollar agricultural budget for 1943 by $600,000.

New industrial developments include a $1,500,000 tunnel for Leadville mines, a refining plant for Richfield Oil, costing $13,000,000 at Wilmington, southern California, and a $30,000,000 award for an undisclosed type of navy vessel to Commercial Iron Works of Portland.

NEW YORK

Reports indicate that no substantial setbacks occurred during the past week and most of the heavy industries continued to operate at their recent high levels.

Construction in the United States continues to decline. Civil engineering construction volume in continental United States totaled $50,755,000 last week, a decrease of 30 percent under the preceding week and 42 percent below the total for the corresponding 1942 week, *Engineering News-Record* reports. Private construction was 76 percent lower than the preceding week, but climbed 66 percent above last year. Public work topped the preceding week by 1 percent as a result of the 5 percent gain in federal volume, but was 41 percent below a year ago.

According to authoritative sources, the nation's retail trade, which in 1943 will break all previous records in point of sales volume, is expected to show a gain in the year's final quarter of between 8 and 10 percent over the comparative 1942 period. Christmas trade probably will top last year's all-time peak holiday business.

CHICAGO

In the greater Chicago area private housing only has shown a very slight tendency to increase in recent months. Military construction, war housing, community facilities and government-financed industrial facilities have all continued to decline.

Manpower remains the most critical shortage in Michigan, Indiana, Illinois, Wisconsin and Iowa. Labor supply conditions in five industrial centers in this area became sufficiently limited during the month that the War Manpower Commission reclassified them on October 1 into Group 1 areas of current acute labor shortage.

For the third successive week the number of war contracts awarded to Chicago firms by various government agencies have declined. In the latest week, ended October 21, only 69 orders were placed with 61 firms for a total of $3,476,000 in goods and services. Among the recent contracts placed is one with Thordarson Electric Mfg. Co. for an undisclosed number of transformers for the Navy; another with Standard Electric Mfg. Co. for 2,000 10-amp. snap switches and 1,000 5-amp. snap switches, also for the Navy.

While local electrical manufacturers continue to report little or no activity for standard line products among utilities, scattered orders for industrial electrical equipment are being received from war plants and military establishments outside the continental limits of the United States.

Sales Opportunities

WISCONSIN—Light and Water Commission, Cedarburg, has authorized new power substation, for which plans will be prepared at once. Site has been selected. No estimate of cost announced.

OKLAHOMA—War Department, Washington, D. C., has authorized two new hangars at an airport, with mechanical and electrical equipment. Cost about $200,000. Work will begin soon. U. S. District Engineer Office, Citizens' Bank Building, Denison, Tex., will supervise project.

WASHINGTON—Victory Metals Co., Colville, L. G. Slater, manager, plans power substation at new zinc and lead refining plant, comprising several buildings, to be equipped for initial capacity for handling about 100 tons of ore per day, later to be increased to 300 tons daily. Work is being rushed under way. Cost reported over $500,000, with mechanical and electrical equipment. Company has contracted with Washington Water Power Co., Spokane, for power supply, which will extend transmission line to plant site.

ILLINOIS—National Malleable & Steel Castings Co., 10600 Quincy St., Cleveland, Ohio, has contracted with government for expansion in plant, with machinery and electrical equipment. Cost about $890,000, with financing by Defense Plant Corp. Work will be carried out soon.

MISSOURI—Water and Light Department, Columbia, plans expansion and improvements in municipal power station as a post-war project. Also will make extensions in power substations, distribution lines and service facilities. Plans are being prepared and appropriation arranged. Post-war program will include extensions and improvements in municipal airport, including new buildings, mechanical and electrical facilities, estimated to cost about $500,000. Dewey Welch is city engineer, in charge.

CALIFORNIA—War Department, Washington, D. C., has authorized new air force base, comprising hangars, shops, warehouses and other industrial buildings, with mechanical and electrical equipment. Also power substation installation, with distribution system and service connections. Barracks, mess hall and miscellaneous structures will be built. Entire project will cost about $1,000,000 and will be supervised by U. S. District Engineer Office, Los Angeles.

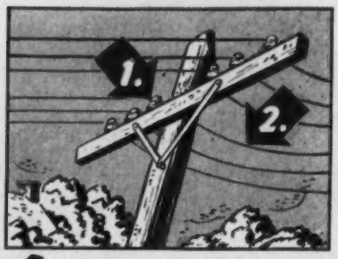
OREGON—American Can Co., 230 Park Ave., New York, N. Y., has acquired tract of about 28 acres of land as site for new plant to serve southern Oregon and points in northern California. It will comprise several one and multi-story production buildings, with machinery and electrical equipment for large capacity. Also miscellaneous units for storage, distribution, etc. A power substation is planned. Entire project is reported to cost close to $1,000,000. It is understood that a priority rating will be secured.

MICHIGAN—Chrysler Corp., 341 Massachusetts Ave., Detroit, will carry out expansion in a plant for production for government, including new building, with machinery and electrical equipment. Cost estimated about $410,000, with financing by Defense Plant Corp. Work is scheduled to proceed at early date.

DANGER LINES

Regular Pole Inspection is a Preventive

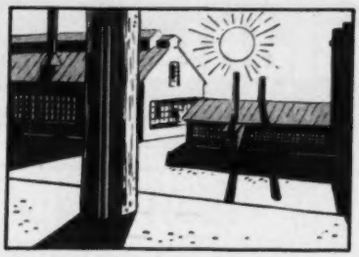
A single defective pole may result in a dual power failure. If power failure occurs at either points 1 or 2, production in nearby war plants will be at a standstill. And, all for the lack of regular pole inspection which would have indicated the need for a proper-weight guy wire to give this pole the support it needs to keep it firm and straight, ease the tension on one side, take up dangerous cable slack on the other.



1. Cable connections at this point are in danger of being completely disconnected.

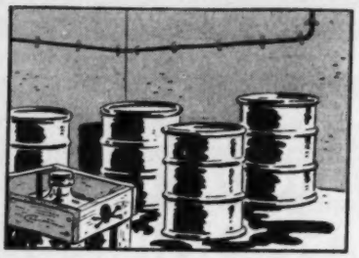
2. These slack cables may whip together in the wind and arc.

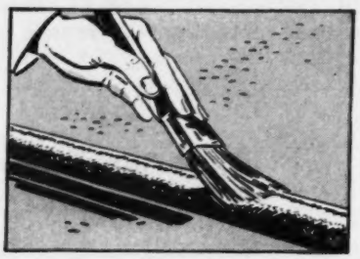
"PUTTING THE BEE" ON WAR PLANT CABLE FAILURES—OUTDOORS



1. Run wiring in shadiest place possible—such as north side of pole, pipe, or building, or under side of a bridge. Sun and heat are insulation saboteurs.

2. Place wiring where it will not come into contact with oil or acid. Insulation may be damaged—failure result.





3. Apply weatherproof coating to cable sheathing every year or two, sealing moisture out, adding years to cable life.

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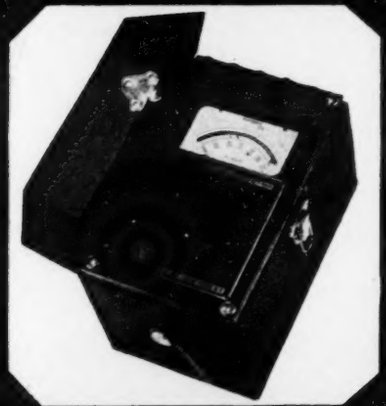

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LOUISIANA—City Council, Winnfield, has called special election on November 16, to approve a bond issue of $260,000, majority of proceeds to be used for a proposed municipal light and power plant, with electrical distribution system. Remainder of fund will be used for extensions in municipal water system, with installation of electric-operated pumping machinery and other facilities. James M. Fourmy, Hammond, is consulting engineer.

MINNESOTA—City Council, Eveleth, is arranging for federal fund of about $500,000 for completion of municipal airport, now partially constructed, with new buildings, lighting system, control station, distribution lines and other electrical and mechanical facilities.

WISCONSIN—Metal-Mold Corp., 95 Hamilton St., Cedarburg, is completing plans for one-story addition for production for government, and will begin erection soon. Cost about $200,000, with machinery and electrical equipment. Financing by Defense Plant Corp. Emil A. Abendroth, 1140 East Bywater Lane, Milwaukee, is engineer.

FLORIDA—Light and Water Department, Ocala, plans expansion and improvements in municipal electric power plant as a postwar project or earlier if materials and equipment are available. Proposed to install new steam-electric turbine unit and auxiliaries. Also will make additions and improvements in electrical distribution system. Fund of about $500,000 will be arranged for this and proposed extensions and betterments in waterworks and sewage system. E. P. Clark is city manager in charge.

TEXAS—War Department, Washington, D. C., has approved plans for air force base, comprising hangars, shops, warehouses and other industrial buildings, with mechanical and electrical equipment. A power substation is planned, with electrical distribution lines and service facilities. Also will build barracks, mess hall, administration building and miscellaneous structures. Entire project will cost over $1,000,000, and will be placed under way at once. It will be supervised by U. S. District Engineer Office, San Antonio.

TENNESSEE—Firestone Tire & Rubber Co., Memphis, has approved plans for new one-story addition to local plant, totaling about 100,000 sq. ft. of floor space. Cost reported in excess of $600,000, with machinery and electrical equipment. Work is scheduled to begin at once. Main offices are at Akron, Ohio.

PENNSYLVANIA — Beryllium Corp. of Pennsylvania, Reading, manufacturer of beryllium, copper and other metal alloys, will carry out expansion in plant for production for government, with installation of machinery and electrical equipment. Cost estimated about $200,000. Financing by Defense Plant Corp. Proposed to proceed with work at early date.

TEXAS—War Department, Washington, D. C., has authorized new air force base, comprising hangars, shops, warehouses and other industrial structures, with mechanical and electrical equipment. Also will build barracks, mess halls, administration building and other miscellaneous structures. A power substation is planned, with electrical distribution system, service connections and other operating facilities. Cost over $5,000,000. Project will be supervised by U. S. District Engineer Office, Citizens Bank Building, Denison.

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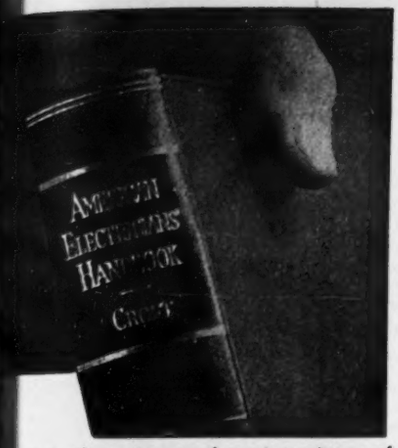

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LETTER TO THE EDITOR

Independent Criticism of Engineering Design

To the Editor of ELECTRICAL WORLD:

Permit me to congratulate you for establishing a precedent in the electrical engineering literature by publishing, in your September 18 issue, an article entitled "Waste in Electrical Construction in War Plants," and your editorial entitled "Mistakes Now Appearing," criticising some so-called designs that, according to the author, appear to be plain screwball. I am not ready to agree with the policy of criticising a design without first trying to find out if conditions did not dictate a screwball design, nor with the idea of selecting a piece of construction which had to be done in a great hurry. In fact, the remedy suggested by the author is also screwball. I could take you around some utility plants and industrial installations where plenty of time was available for planning and where the designs are just plain amateurish mazes, worse than those used by professors of psychology for demonstrating the habit-forming ability of rats.

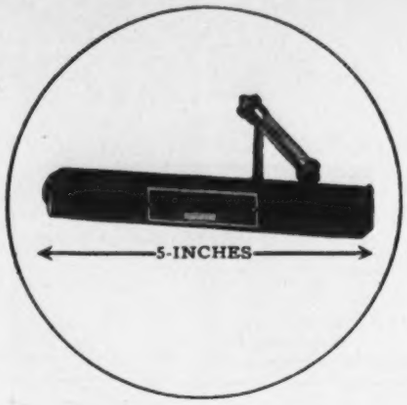
What I am complimenting you on is the fact that, for the first time, you deviated from the custom of letting the designer himself describe his design and proclaim a commonplace or even an obsolete design as the most brilliant innovation known to man, and started the new idea of letting an independent reviewer criticise the brainchild of another man. In the theatre a professional reviewer reviews a new play, and not the author.

It would take pages to establish the reasons why there are more screwball designs in the electrical branch than in any other branch of engineering, but you will permit me to mention a few, and I hope that your demonstrated courage will be again evidenced by not being afraid to print it:

1. No matter how screwbally or mazy the design may be, the juice somehow manages to find its way.

2. Complicated designs look more imposing than simple designs. Only the very experienced designer knows that a straight line between two points is the most difficult to find because it is only one of an infinite number of possibilities and, once found, is generally not appreciated because every one thinks that it was easy.

3. Construction men and operating men do not appreciate that designing is a separate profession. Instead of con-



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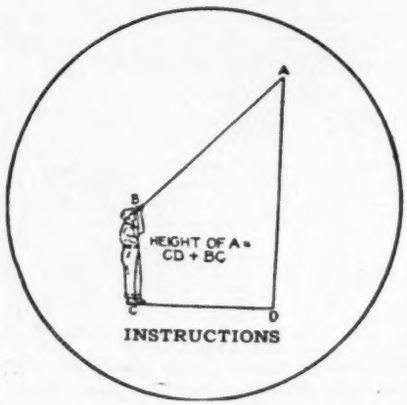

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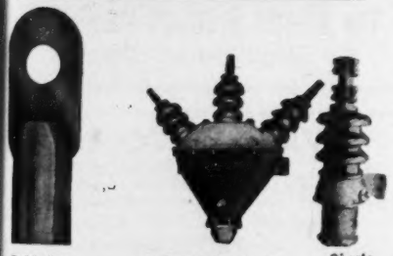

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sulting an experienced designer, they try to do their own designing and frequently produce monstrosities. But, unfortunately, these monstrosities work.

4. There are too many engineers in charge of design who never worked in the drafting room. No engineer should be permitted to be in charge of design unless he can show several years experience in the drafting room.

5. There is too much free engineering service. It is indeed surprising to find American business men who believe that they get something for nothing. The lighting field, for instance, shows more monstrosities and criminal waste of money than any other field of electrical engineering, and in this field there is hardly an independent consulting engineer who makes a living from furnishing honest lighting engineering service. It is all done for nothing.

Keep up the good work, introduce more independent criticism. Only thus will we ever secure appreciation for competent engineering designs and only thus will those who invest their money realize that it is profitable in the end to pay fees for competent designing.

M. M. SAMUELS, Chief,
Technical Standards Division, REA.

•

New Funds Allotted for Rural Projects

The Department of Agriculture recently announced allotments totaling $706,000 to 15 Rural Electrification Administration co-operatives in ten states.

Funds borrowed under these allotments will be used to finance facilities already completed in accordance with War Production Board regulations; to acquire existing properties which will facilitate electrification of additional farms in the post-war period, and for immediate extension of service to farms qualifying under present WPB regulations permitting connection to nearby rural power lines of farms producing livestock, dairy and poultry products. No new construction will be undertaken except in accordance with authorization or regulation of WPB.

Included are the following:

IOWA—Eastern Iowa Light & Power Co-operative, Davenport, $70,000.

MINNESOTA—Steele-Waseca Co-operative Electric, Owatonna, $65,000.

MISSOURI—West Central Electric Co-operative, Inc., Higginsville, $100,000.

NEW YORK—Delaware County Electric Co-operative, Inc., Delhi, $90,000.

PENNSYLVANIA—Blair Valley Rural Electric Co-operative, Inc., Huntingdon, $116,000.

TEXAS—McCulloch County Electric Co-operative, Inc., Brady, $35,000; Midwest Electric Co-operative, Inc., Roby, $30,000; Nueces Electric Co-operative, Inc., Robstown, $25,000.

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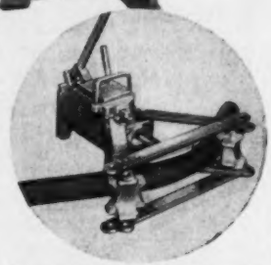

You can save vital hours on war jobs, today, with Greenlee Benders. These powerful, hydraulic benders form smooth, uniform bends in a jiffy—eliminate tedious filling and heating methods—save as much as 75% on many jobs. Tailor-made attachments prevent kinks and serious distortion—are interchangeable—only one No. 770 power unit is required for most jobs.

ATTACHMENTS FOR EVERY BENDING JOB!

For fixed-radius bends up to 90°, two standard sets of radius-shoe attachments are provided. One set bends ¾" to 2" thin-wall conduit (E.M.T.); second set handles ¾" to 2" copper, brass, aluminum, or steel pipe (I.P.S.). For varying radius bends, a set of segment-shoe attachments is provided for ¾" to 3" rigid-conduit or standard pipe. Also available are special attachments for all types of tubing and for bus-bar bending. *All are interchangeable and can be used on Greenlee No. 770 power unit.* For larger conduit and pipe up to 4½", a more powerful Bender — the Greenlee No. 775 — is provided, complete with attachments.

NEW SMALL-RADIUS HAND BENDERS
STOP KINKS

Forming small-radius bends in all types of small tubing, pipe, or conduit is a fast, easy task with Greenlee Hand Benders. They make smooth, neat-looking bends without kinks, wrinkles, or serious distortion. *Write for New Circular S-120.*

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ENGINEER, 46, Splendid health, married, college graduate, 23 years experience all phases Public Utility work, electric and gas, power plant operation, desires connection making use of experience. Excellent references. PW-614, Electrical World, 330 W. 42nd St., New York 18, N. Y.

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OUTSTANDING TRANSMISSION LINE CONTRACTOR seeks representative with following among Eastern utilities. RW-615, Electrical World, 330 W. 42nd St., New York 18, N. Y.

OFFICIAL PROPOSAL

Bids: November 8, 1943 (191)

ELECTRICAL WORK
SOUTH DISTRICT FILTRATION PLANT
DEPARTMENT OF PUBLIC WORKS
CITY OF CHICAGO
CHICAGO, October 15, 1943.

SEALED PROPOSALS will be received by the City of Chicago until 11 A. M. (Central War Time), Monday, November 8, 1943, at Room 406, City Hall, at which time and place all such proposals will be opened publicly and read, for furnishing all labor, materials, equipment and services necessary to perform certain Electrical Work in connection with the construction of the South District Filtration Plant, located on the lake front, east of South Shore Drive and north of East 79th Street, Chicago, Illinois, in accordance with plans and specifications on file in the office of the Department of Public Works of said City, Room 406, City Hall.

In general, said Electrical Work shall consist of furnishing and installing Switchgear, Switchboards, Motor-generator battery charging units, Copper-oxide battery charging units, Storage batteries and racks, Power and lighting transformers, Motor starting and control apparatus, Power and lighting cabinets, Grounding system, Lighting system, Power system, Control, signal and alarm system, Underground duct lines, also, connecting electrical apparatus furnished and installed under other contracts.

Proposals must be made out upon blanks furnished at said office, and be addressed to said Department, indorsed "Proposal for Electrical Work, South District Filtration Plant," and be accompanied with Fifteen Thousand Dollars ($15,000.00) in money or a certified check for the same amount on some responsible bank located and doing business in the City of Chicago and made payable to the order of the Commissioner of Public Works.

Plans and specifications may be obtained upon payment of Fifty Dollars ($50.00) for each set, which will be refunded upon the return of said plans and specifications in good condition within thirty (30) days after the opening of bids. Deposits to be in the form of money or certified check.

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Also TANKS, Commercial, Vertical and Horizontal
From 2879 to 12,500 gals. and even much large.
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38 years' experience
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FOR SALE
BX CABLE
Large Quantity.
Make Best offer per 500 feet minimum.
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MOTOR WANTED
One 750 to 1000 KW synchronous motor, 3 phase, 60 cycle, 2300 volts, 240 R.P.M.
The Shartle Brothers Machine Co.
Middletown, Ohio.

WANTED TO BUY
Weston Model 326 Laboratory Standard Voltmeter; also sensitive research a.c.-d.c. polyrangers for war production.
DUNCAN ELECTRIC MFG. CO.
LAFAYETTE, INDIANA
Attn: Stanley Green

OFFICIAL PROPOSAL

Act of the General Assembly of the State of Illinois, entitled "An Act regulating wages of laborers, mechanics and other workmen employed under contracts for public works," approved June 26, 1941, the general prevailing wage rates for work at the construction site are set forth in the specifications.

The Commissioner of Public Works reserves the right to reject any or all bids.

No proposal will be considered unless the party submitting the same shall furnish evidence satisfactory to the Commissioner of Public Works of ability, and the possession of the necessary facilities, together with sufficient pecuniary resources, to fulfill the conditions of the contract and specifications.

OSCAR E. HEWITT,
Commissioner of Public Works.

SUCCESSFUL OPERATION GUARANTEED

Every Machine in This Ad is Owned Outright By Us

D C MOTORS

HP	Make	Type	Volts	Speed
1250	G.E.	MPC	550	130
800	G.E.	MPC	660	600
625	G.E.	MPC	500	130
600	G.E.	MPC	600	650/900
600	Whse.		260	150/275
600	G.E.	MPC	230	450
350	G.E.	DMC	230	400/600
300	G.E.	MPC	230	275/550
300	Whse.		500	250/400
270	Al. Ch.		230	525
250	Whse.		230	400
200	Whse.	SK	250	150/525
175	G.E.	RC-19A	230	800/1000
150	Whse.	SK-201	230	300/900
150	Whse.	CMC-152HL	230	300/1200
150/200	Cr. Wh.	MPC	230	250/450
150	G.E.	CO-1832	230	625
125	G.E.	SK-180	230	720
120	Whse.	LC-50	230	1200
100	G.E.		230	950/1150
100	Al. Ch.	MPC	230	225/450
100	G.E.	RC-19	230	575/720
100	G.E.	LC	230	500/1000
75	Whse.	SK	230	475/900
75	Whse.	SK-183	230	550/1100
75	G.E.	2SS	230	525/1050
60	El. Dy.	65H	230	500/1000
50/60	Cr. Wh.	RC-19	230	400/1200
50	G.E.	CMC-81H	230	300/900
50	Cr. Wh.			

TRANSFORMERS

KVA	Make	PH	Type	Voltages
1667	Pitts	1	OISC	13200x2300
1050	G.E.	3	WCTH	11000x445
600	G.E.	3	HT-OISC	11550x2200
400	Whse.	1	S-OISC	2400x440
333	Moloney	1	C-OISC	22000/11000x2300/575
333	Whse.	1	OISC	2300x460
333	Pitts.	1	OISC	2400x220
300	G.E.	1	H-RP	13200x575/1150/2300
300	Pitts.	3	ODSC	4150x208/120
300	Packard	1	OISC	2200x220/440
200	G.E.	1	H-LDD	26400x115/460
200	G.E.	1	H-OISC	2300x115/230

MOTOR GENERATOR SETS

3 ph. 60 cycle

1—500 KW GE 600 V. DC Gen. d.c. to 700 HP—2200/13200 V. Syn. Motor with Exciter.
1—400 KW G. E. 250/275 V. Gen. to 700 HP ATI 440/2300/4000 V. motor
2—250 KW GE 250 V. Gen. d.c. to 375 HP—2200 V. Syn. Motor.
2—100 KW Whse. SK 250 V. Gen. to 150 HP Syn. 2300 V. 900 RPM motor with excit.
1—75 KW G. E. 125 V. Gen. to 120 HP IK 4000/2300 V. motor

TURBO GENERATOR SET

1—500 KW, Whse. 625 Kva., 440 V., 3 ph., 60 cy., 3600 RPM with Parsons 145/175 lb. condensing turbine complete with jet condenser and accessories.

ROTARY CONVERTERS

60 cycle

	KW	Make	Speed	D.C. Volt	Trans. Volts
1—	1500	Whse.	720	600	2300
1—	1500	Whse.	600	600	11500
1—	1250	G.E.	720	250	2300
1—	1000	G.E.	900	600	13200
1—	1000	Whse.	900	600	11000
2—	750	G.E.	1200	600	2300
1—	750	Whse.	720	250	6600/2300
1—	500	Whse.	1200	600	13200/2300
2—	375	G.E.	1200	250	6600/2300
3—	300	G.E.	1200	600	2300

25 cycle

2—	1500	G.E.	500	225/275	13200/6600
1—	500	G.E.	750	225/275	13200/6600

All units can be furnished with AC and DC controls.

A. C. MOTORS

3 ph. 60 cycle

Synchronous

	HP	Make	Type	Volts	Speed
1—	500	G.E.	TS	440	360
1—	250	G.E.	ATI	220	450
1—	225	G.E.	ATI	240	600
1—	220	Whse.		440	514
1—	150	Al. Ch.		2300	900
1—	159	Whse.	G	2400	900
1—	150	Whse.	G	2300	900
1—	150	Whse.		2200/550	1800
2—	100	Whse.	G	2200	1800

Slip Ring

1—	1200	Cr-Wh.	801-Q	2200	237
1—	800	Whse.	CW	440	357
1—	800	Al. Ch.		440	885
1—	600	G.E.	IM	440	900
1—	450	Whse.	CW	2200	875
1—	400	G.E.	MT	550/440	300
1—	400	Al. Ch.		2300	605
1—	350	G.E.	IM	2300/4000	257
1—	300	Whse.	CW	440	585
1—	300	G.E.	IM	440	720
2—	250	G.E.	MT	440	450
1—	250	G.E.	MT	4000/2300	257
2—	200	G.E.	IE-M	2200	1750
2—	200	Whse.	CW	2200	514
1—	200	G.E.	IM	440	600

Squirrel Cage

1—	500	G.E.	1-17B	2200	695
1—	400	Whse.	CS-1104A	2200	585
1—	300	Whse.	CS	550	580
1—	300	G.E.	IK	2300	600
1—	250	Al. Ch.		220/440	1150

SYNCHRONOUS CONDENSERS

1—	1000	G.E.	ATI	2200/3800	900
1—	750	G.E.	ATI	220/440	900
1—	600	G.E.	ATI	220/440	900

RE-NU-BILT BELYEA MOTORS

What are your requirements? units up to 5000 kw available in stock.

BELYEA COMPANY INC.

Main Office & Shop: 51 HOWELL ST., JERSEY CITY, N. J.

J.L.HEMPHILL & CO. Inc.

ELECTRICAL ENGINEERS AND EQUIPMENT

1602 53rd Street, North Bergen, N. J.

N. Y. C. Tel.: LOngacre 5-3227—N. J. Tel.: UNion 3-2600

MOTOR—3 PHASE 60 CYCLE

1—6000 ampere, 6 volt, Hanson-Van Winkle
1—2000 ampere, 6 volt, Hanson-Van Winkle
1—1500 ampere, 6 volt, Hanson-Van Winkle
1—500 HP, 900 RPM, 440 volt, Lincoln slip ring
1—400 HP, 514 RPM, 440 volt, Westg., slip ring
1—335 HP, 600 RPM, 2300 volt, G.E. syn.
1—500 HP, 900 RPM, 440 volt, Lincoln slip ring.
1—250 HP, 514 RPM, 4000 volt, G.E., syn.
1—250 HP, 600 RPM, 4000 volt, G.E., sync.
1—200 HP, 600 RPM, 2200 volt, G.E., sl. rg.
1—200 HP, 450 RPM, 2200/4000 v. G.E., sl. rg.
1—150 HP, 1800 RPM, 440 volts, G.E., sq. cg.
1—150 HP, 900 RPM, 440 volt, Al. Ch. sl. rg.
3— 75 HP, 1200 RPM, 2300 volt, G.E., vertical.

MOTORS—D. C. 230 VOLTS

2—450 HP, 400 RPM, General Electric MPL.
1—250 HP, 760 RPM, Electro Dynamic.
2—150 HP, 550 RPM, Westinghouse, SK.
1—150 HP, 750 RPM, Electro Dynamic.
1—125 HP, 800 RPM, Westinghouse, SK.
1—100 HP, G.E., 575 RPM.
1—100 HP, 625 RPM, G.E.
1— 65 HP, 1000 RPM, G.E., type RC.
1— 50 HP, RPM, Westinghouse, type SK.

TRANSFORMERS

2—400 KVA, G.E., 4156-240/480 v. Scott taps.
3—300 KVA, Pittsburgh, 7800/440 volts.
2—250 KVA, General Electric 6600/2200/220/440.
3—200 KVA, General Electric 2200/220/440.
3—200 KVA, G.E., 2200-220/440 volts.
3—150 KVA, G.E., 33,000 2300/4000 Y.
3—100 KVA, Westinghouse, 11,430/250 volts.
3—100 KVA, G.E., 2200-220/110 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
3—75 KVA, General Electric 2200/220/440.

MOTORS GENERATOR SETS

1—750 KW, 250 volt, Allis Chalmers, synchronous.
1— 75 KW, 125 volt, Crocker Wheeler, synchronous.
1— 35 KW, 125 volt, Elec. Machinery, sq. cage.

MOTORS—VARIABLE SPEED 230 VOLTS

1—750 KW, 250 volt Allis-Chalmers synchronous.
1—150 HP, 350/1050 RPM, Crocker-Wheeler.
1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electric Dynamic.
1—35 HP, 500/15000 RPM, Westinghouse.
1—35 HP, 350/1050 RPM, Electric Dynamic.
1—30 HP, 225/900 RPM, Crocker-Wheeler.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1—5 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker-Wheeler.

ALTERNATORS

1—625 KVA, 3600 RPM, 600 volt, G.E.
1—250 KVA, 720 RPM, 230 volt, G.E.
1—225 KVA, 514 RPM, 600 volt, Westinghouse.
1—200 KVA, 3600 RPM, 240 volt, Allis Chal.
1—62½ KVA, 3600 RPM, 220 volt, Allis Chalmers.

TURBO-GENERATORS

600 KW, Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.

ENGINE GENERATOR SETS

1—150 KVA, General Electric Generator, Ames Uniflow engine.
1—62½ KVA, Westinghouse Generator, Fairbanks company engine.

Complete Line of A.C. and D.C. Motors and Generators

Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries, Transformers, Motors, Compressors, etc.

Service backed by 38 years' experience

BREW, WOLTMAN & CO.

30 Church St., New York

MOTORS

100 H.P. G.E. synchronous motor type T.S. serial #5504251, direct connected exciter, 440 volt., 3 phase, 60 cycles, 1200 R.P.M., starting equipment.

30 H.P. Star Electric motor style SY-504, ballbearing, serial #231362, 220 volt, 3 phase, 60 cycles, 685 R.P.M., Cutler Hammer variable speed controls.

DENNY & CLARK

910 N. Marshfield Ave., Chicago, Ill.

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New or used. All types and sizes. Air and oil cooled. Phase changers a specialty.

ATLANTIC TRANSFORMER CO.

Transformer Specialists

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Gen. Electr. Motor-Generator Set (new). Motor—75 HP 2200 volts, 60 cycles, 1155 RPM. Generator—125 volts D.C. 400 amp.

Three Gen. Electr. Transformers (like new) voltage 6600 (Y11430):2300, 250 K.V.A. 60 cycles. Weight 2850 lbs. each.

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ENGINE GENERATOR SET

250 KVA, 240 V. 3 phase General Electric Generator, Hewes & Phillips corliss engine, 120 RPM. Belt Driven exciter G.E. Type RC. 12 KW, 550 RPM, 125 V.

J. E. MERGOTT CO.

316 Jeliff Ave. Newark, 8, N. J.

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SAVE TIME

Ever think what a time saver advertising is? In this issue you have helpful information from dependable manufacturers! Look each page over carefully—you may find the answer to your most pressing problem.

■

PROFESSIONAL SERVICES .....

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SEARCHLIGHT SECTION

(Classified Advertising)

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POSITIONS WANTED .....
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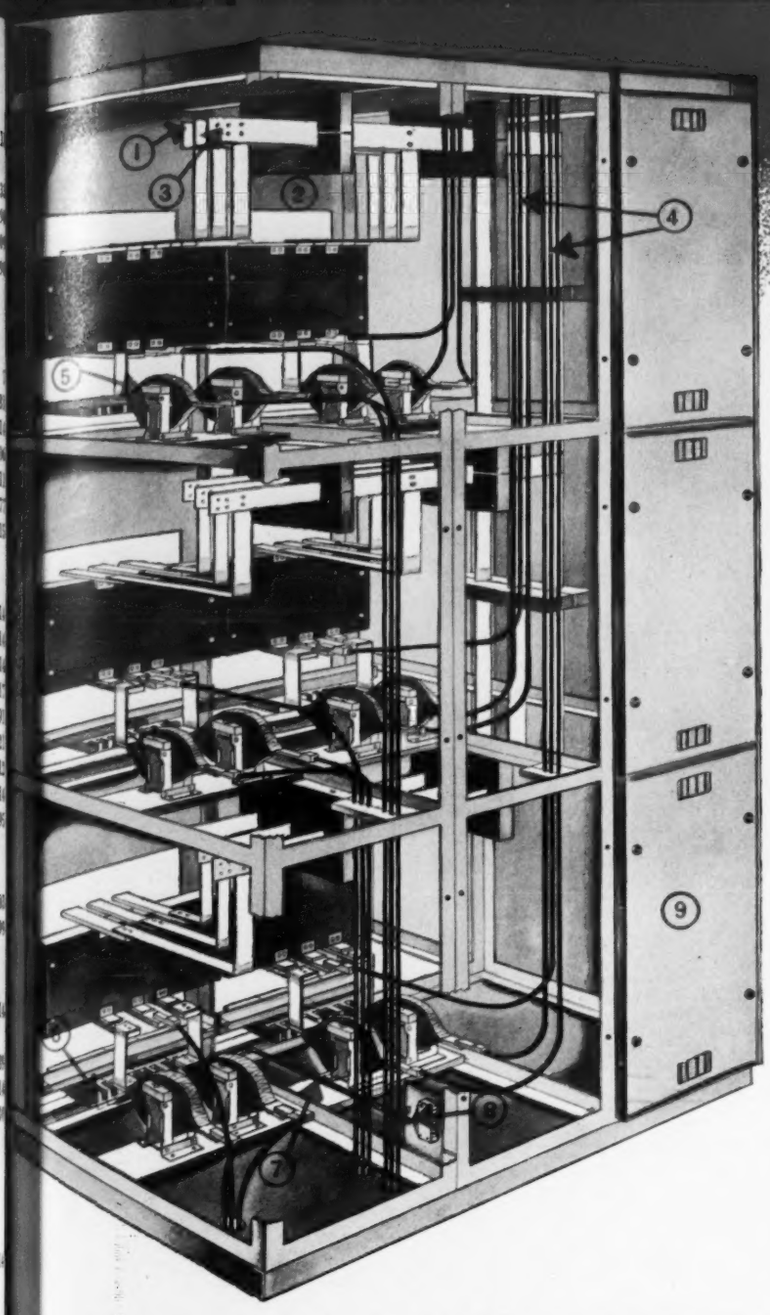
EL WORLD 5849—DEPT—10-30

★ These companies have supplied additional buying information on their products in the 1943 edition of the Electrical Buyers' Reference



① **SILVER-PLATED BUSES**—All buses and connection bars are silver-plated, giving permanent freedom from overheating at the joints. Buses are drilled for future extensions. Tubular or channel buses may be used for heavy currents.

② **BUS SUPPORTS**—Blocks of insulating material impregnated with phenolic compound provide rigid support. Buses are braced for short circuit currents equal to interrupting rating of largest circuit breakers installed; minimum 25,000 amperes.

③ **BOLTED JOINTS**—All joints are made with two or four bolts with lock washers for permanent tightness. Silver-plating assures low millivolt drop. Where required, spacers maintain sufficient clearance for adequate ventilation between bars.

④ **PRIMARY CABLES**—May enter from floor or from overhead. Cable terminal connectors provided may be solder type or solderless clamp type, whichever purchaser prefers. Connector contact surfaces are silver-plated.

⑤ **INSTRUMENT TRANSFORMERS**—Current transformers connected in primary circuits as shown. Contact surfaces are silver-plated. Purchaser may specify make desired. Accuracy and burden to suit requirements. Potential transformers also available.

⑥ **SMALL WIRING**—No. 14 gauge (AWG) for control and protection circuits. Stranded, tinned, copper conductor insulated with synthetic rubber, flameproof felted asbestos and cotton braid. Dependable material for this essential service.

⑦ **WIRING CONDUITS**—Completely isolate control and signal circuit wires from primary conductors. Contribute an extra margin of safety with added security for operators and dependable operation of protective devices.

⑧ **TERMINAL BLOCKS**—Eliminate splicing, soldering and taping of small wiring and practically exclude possibility of high resistance joints and open circuits. Marking strips identify each wire without time-consuming tracing.

⑨ **REMOVABLE PANELS**—Completely enclose live parts; are readily removed for inspection. Flanged edges with welded corners make each panel stiff and free from warping. Bolts are attached and "lose-proof".

BUS COMPARTMENT DETAILS IN I-T-E DRAWOUT SWITCHGEAR

The details identified above represent standards of I-T-E design and construction. Such standards, however, should be noted in the light of an important, fundamental fact—that bus arrangements in switchgear enclosures are individual problems; that conditions of each installation are the guides. How deeply and thoroughly I-T-E examines the requirements of each job, can be gathered from a 24-page bulletin recently published, written by William Deans, Chief Engineer at I-T-E—"Electrical Buses and Bus Structures," Bulletin No. 4211. There have been more than 5000 requests for this bulletin; a few copies are available. For a point-by-point description of I-T-E drawout-type switchgear assemblies, including bus structures and compartment details, we have Bulletin 4207, which we will be pleased to send to you.

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR • ENCASED IN STEEL

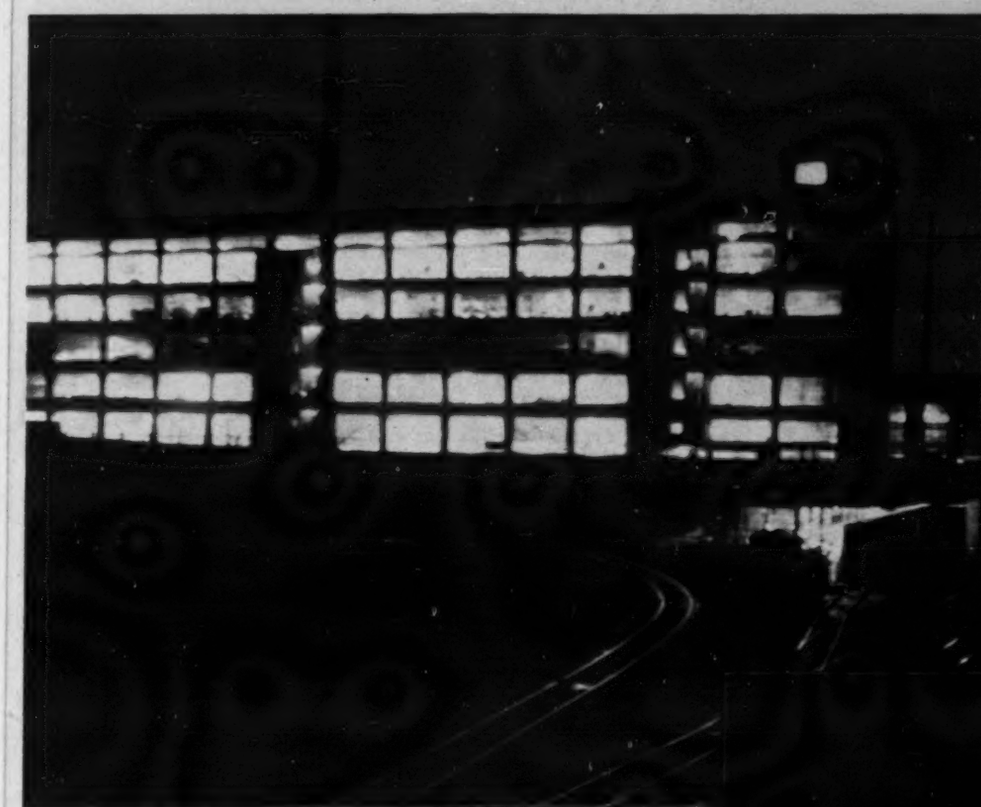
Representatives in Principal Cities

CIRCUIT BREAKER CO., PHILADELPHIA, PA.

Kuhlman Products

TRANSFORMING AND USING THE POWER THAT YOU PRODUCE

In almost every locality in America where you see the brightly lighted war plants, where, day and night, you hear the hum and clatter of machinery on production, Kuhlman Transformers are at work. Kuhlman Transformers are built to stand up on the job year after year with a minimum of maintenance. The transformer shown here, built for use with a Type AA Detroit Rocking Electric Furnace (see below), is a 531 KVA Single Phase high reactance arc furnace transformer equipped with external tap changers for adjusting both the voltage and reactance values.



The Detroit Electric Furnace Division of Kuhlman Electric Company is playing an especially active role in America's Battle of production. Using electricity rather than fuel, these fast-melting efficient furnaces are helping conserve the nation's fuel and metal deposits. They are an important factor in speeding up the production of essential war needs in ferrous and non-ferrous foundries and casting shops.

Write for complete facts regarding postwar load-building, revenue-producing opportunities.

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